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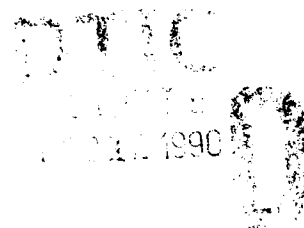
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PLANNING AND IMPLEMENTING  
TOTAL QUALITY MANAGEMENT  
IN THE ROYAL AUSTRALIAN AIR FORCE:  
A MULTIPLE CASE STUDY ANALYSIS

THESIS

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AFIT/GLM/LSM/90S-40



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THESIS

Presented to the Faculty of the School of Systems and  
Logistics of the Air Force Institute of Technology  
Air University  
In Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Logistics Management

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September 1990

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Clayton L. Noble

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Abstract

The Royal Australian Air Force (RAAF) is committed to the world-wide challenge to constantly improve quality. Total Quality Management (TQM) is one initiative being investigated by the RAAF to achieve continuous improvement of its processes. The purpose of this ~~study~~<sup>study</sup> was to examine the elements of a TQM program, and provide guidelines for introducing TQM into the RAAF.

To accomplish the research objectives, a literature review of quality-related material was conducted. Quality principles and techniques were discussed, as was development of strategies of continuous process improvement. In addition, multiple case study analysis of selected U.S. DOD organisations which have implemented TQM, was used to highlight the problems associated with introducing TQM in a military environment.

The study found that TQM appears to be an effective strategy for achieving continuous improvement in quality and productivity. The guidelines provided for implementation of TQM in the RAAF focused on five fundamental elements: culture, management direction, organisation, people, and continuous process improvement. The integration of these five elements forms a strategy for TQM implementation in the RAAF. (K.P.)

PLANNING AND IMPLEMENTING TOTAL QUALITY MANAGEMENT  
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I. Introduction

General Issue

The 1987-88 and 1988-89 (Australian) Defence Reports submitted to Parliament, emphasised the priority given to shaping a defence force which can attain unprecedented levels of performance, yet remain within tight budgetary constraints. To achieve that end, the Royal Australian Air Force (RAAF) is streamlining organisations and decision paths, devolving responsibility and reordering priorities (Department of Defence, 1988:vii-viii). Furthermore, top-level management has committed the RAAF to internalising a commitment to improving quality in the organisation's processes and products. The Chief of the Air Staff has stated:

The present state of the Australian economy and the Australian Government's policy reaction will ensure that major financial restraints will continue to be imposed on the Australian Defence Force for the foreseeable future. Faced with the reality and the fact that we must continue to develop and improve our national defence capability, I strongly support Command initiative to introduce the concept of Total Quality Management (TQM). (Funnell, 1989:20)

### Specific Problem

The RAAF is a newcomer to the management approach known as TQM. Although a TQM office has been established in one command, a formal methodology for introducing the program into the RAAF as a whole has yet to be adopted. This research investigates critical strategic changes and general implementation issues associated with TQM application in an organisation. Guidelines for implementing and sustaining TQM in the RAAF are provided.

### Research Questions

The questions addressed in this research are:

1. What is TQM?
2. What are the key elements to implementing a quality improvement program? How should change be managed?
3. Is TQM important to the U.S. DOD and how is it being implemented?
4. What lessons can be learned by the implementation of TQM in the U.S. DOD community?
5. How should the RAAF implement TQM?

### Scope of Study

This thesis does not provide an implementation program for the RAAF. Given the research limitations, only TQM implementation guidelines are given and these are generic in nature, rather than providing details specifically for each organisational element within the RAAF.

## Background

In recent years, organisations have explored many productivity and quality improvement programs in an effort to remain competitive in an economically tight environment. Both private and public organisations face the challenge of meeting needs with fewer resources. In relation to the military, General Alfred G. Hansen, United States Air Force (USAF) has stated:

Today, the challenge facing Western military forces is to confront potential adversaries with pre-INF-equivalent levels of risk by using conventional forces. However, our world is intensely competitive and there exist continual trade-offs between economic and defense needs. (Hansen, 1989:9)

The future viability of Western armed forces depends largely on their ability to inject, in a disciplined way, the concerns, controls, and capabilities necessary to put quality into processes (Hansen, 1989:9). TQM is considered one approach to achieving such quality. In terms of the RAAF, processes can refer to any established activity done on a continuous basis; maintenance, supply, training, acquisition and administration are all examples. No element of the RAAF is excluded from the requirement to seek quality improvement. Each level of management must understand the overall requirements for mission accomplishment, and be willing to review processes to achieve better products. Most organisational processes include sources and customers. The sources and customers may be different organisations, different sections within a single organisation, or even

different work stations within a single section. The product may be a machined part, a contract for spares or the completion of a travel requisition (Warmington, 1988:22). Improved quality, productivity, cost, performance and schedule goals should be the aim for each organisational level.

Implementing lasting quality improvements cannot be realised through short-term, programmatic, and segmented efforts (Metz, 1984:303). TQM has been adopted by numerous organisations as a systematic management approach to quality improvement using a strategically integrated, organisation-wide philosophy. Since it requires a new culture, many problems arise in connection with implementing a major organisational change such as TQM. A review of current literature and TQM case studies within the United States armed forces provide a basis to recommend ways most likely to successfully implement TQM in the RAAF.

This research stresses the importance of top-level management commitment to organisational change, and the need for a top-down approach to implementation of TQM. To date, the RAAF has not adopted such a strategy. Research conducted by Adams and Farnsworth suggests that TQM was introduced to one RAAF command essentially as a pilot programme, using limited funds earmarked for short courses and consultant's fees. Also, the command's TQM implementation plan was never precise, but evolved over time. This was due in part to uncertainty and unfamiliarity with the ultimate scope and

nature of the TQM changes, coupled with underdeveloped strategic management mechanisms (Adams and Farnsworth, 1989:77). In contrast, some U.S. military examples exist in which a TQM philosophy has been embraced by higher level management who subsequently integrated TQM into strategic plans at every level of management and provided TQM funding. Adams and Farnsworth report that growing training requirements and ongoing TQM management costs in the RAAF command have stretched finances, and budget considerations may limit the scale and content of TQM activities in the future. Accordingly, the command is still a little unsure of what level of TQM involvement can be achieved (Adams and Farnsworth, 1989:77).

Notwithstanding these difficulties, the command's TQM initiatives have resulted in documented improvements and may provide a catalyst for accelerating TQM introduction throughout the RAAF. Air Vice Marshal A.R. Reed, RAAF has aptly described to his personnel the purpose of introducing TQM into Headquarters Logistics Command in the following statement:

In directing the introduction of Total Quality Management to Support Command (now Logistics Command), I am conscious of two important benefits to be gained. The most obvious perhaps, is the better use of scarce resources. TQM will assist us to identify and eliminate waste in the Command. I hasten to add that I do not suggest that the waste we uncover is due to any lack of endeavour on your part. Rather that it has accumulated in our processes over the years, and will only be identified using the TQM approach. But every bit important as the elimination of waste is the opportunity to raise the level of satisfaction you derive from your job. TQM will only be successful

through your efforts, and you will learn the tools and techniques which will enable you to contribute to reviews of the processes in your area. I am confident you have many creative ideas for improving the work you do and the service you give your customer, and TQM will allow you a forum to air those ideas. (Adams and Farnsworth, 1989:6)

### Methodology

The primary techniques used for conducting this research include historical research and multiple case study analysis.

Historical Research. The historical research technique consists of ". . . defining the problem, gathering the data, and evaluating and synthesising the data into an accurate account of the subject investigated" (Borg and Gall, 1976:261). The historical source of information for this research was printed documentation addressing the topic of TQM, and other related management approaches to quality improvement in organisations (Borg and Gall, 1976:262). A list of descriptors was submitted to three information retrieval services to extract relevant bibliographic data. Computer data base searches were conducted through Defense Technical Information Center, National Aeronautics and Space Administration, and DIALOG Information Services. Other sources include military and business periodical indexes, and Personnel Management Abstracts. Specific written material relating to the RAAF and United States Department of Defense (U.S. DOD) was obtained by contacting key personnel in those organisations.

Multiple Case Analysis. Multiple case study analysis of selected U.S. DOD organisations which have implemented TQM was used to understand the problems associated with introducing TQM in the military environment. Their implementation strategies were examined and the lessons learned from each approach were addressed. The primary data source for this method was from past reported case studies.

Interviews. Additional information was solicited during interviews with USAF staff involved in implementation of TQM in U.S. DOD. The selected interviewees were senior officers and experienced civilians who had previously, or were currently providing assistance to organisations implementing TQM. The purpose of the interviews was to solicit supplementary information to the documented case studies. The questioning process was semi-structured which allowed open-ended respondent answers. The question construction, question sequencing and interviewer style were tested prior to interviewing respondents by conducting a preliminary interview with a United States Air Force Institute of Technology (USAFIT) senior officer with experience in survey design and TQM implementation. Annex A displays the adopted TQM interview guide.

Limitations. The historical method and multiple case study analysis research approach was selected in preference to a formal case-study strategy. If the research were conducted as a case-study, in-depth interviews would have been necessary and the RAAF's organisational and managerial



processes observed closely. Time and financial resource limitations prohibited the researcher from conducting such studies from abroad.

Report Outline. The previous sections addressed the methodology used to answer the research questions. Chapter 2 addresses Questions 1 and 2. Chapter 3 is a synthesis of case studies and provides information for answering Questions 3 and 4. Chapter 4 provides guidelines for TQM implementation in the RAAF and addresses research Question 5.

## II. Literature Review

### Introduction

This chapter firstly defines quality and discusses the various ways quality can be measured. A summary of the guiding principles and philosophies which act as the foundation for quality management is presented, along with a brief review of measurement tools for tracking quality standards. Application of TQM requires purposeful strategic planning by managers and a commitment to change. The chapter considers the steps necessary to implement TQM, with particular emphasis on the various approaches for continuous improvement. In addition, the implementation barriers commonly experienced are identified and strategies for resolving problems are discussed.

### The Concept of Quality

Quality is not a new concept. In its original form, quality achievement was reactive and inspection oriented, whereas today quality-related activities have broadened beyond and are seen as essential for strategic success (Garvin, 1988:3). Garvin believes a growing number of companies are associating poor profitability to poor quality. Such organisations now link quality to basic business objectives and strategic plans and view quality as an aggressive competitive weapon (Garvin, 1988:21). A succinct summary of the new view of quality that has emerged

during the last decade appears in a report prepared for the 1983 White House Conference on Productivity.

Managing the quality dimension of an organisation is not generically different from any other aspect of management. It involves the formulation of strategies, setting goals and objectives, developing action plans, implementing plans, and using control systems for monitoring feedback and taking corrective action. If quality is viewed only as a control system, it will never be substantially improved. Quality is not just a control system: quality is a management function. (Final Report, 1983:10)

Defining Quality. The word quality has multiple meanings. DiPrimio states there is a need for different definitions highlighting the complexity of the concept. He submits there are basically three quality perspectives: design quality, production quality and perceived quality (DiPrimio, 1987:3). The first defines quality as conformance to requirements. This view implies quality is synonymous with meeting specifications as detailed in the design documentation. Production quality measures how well services are offered in terms of accuracy, timeliness, and consistency (Kent, 1989:15). The third perspective, perceived quality, represents an indicator of how clients perceive the organisation's design and production quality meets their needs (DiPrimio, 1987:3). Garvin believes quality can be defined not by treating it as a single uniform concept, but rather breaking it into eight dimensions which are then considered individually. The products or services are then measured in terms of performance, features, reliability, conformance, durability,

serviceability, aesthetics, and perceived quality (Garvin, 1984:29-30).

Measuring Quality. Traditionally, measurement of quality has been restricted to manufacturing. The emphasis has been on control charts which capture variations from prescribed standards. Garvin argues quality measurement should include financial and customer measures in addition to manufacturing measures (Garvin, 1987:1). Financially-oriented measures quantify the costs of poor quality and the benefits of improvement (Garvin, 1987:6). Customer-oriented measures define quality from the customer's point of view, suggesting quality improvements can be linked directly to higher margins and gains in market share (Garvin, 1987:7).

TQM Defined. The latest, all encompassing quality doctrine is known as Total Quality Management (TQM). The TQM concept is based upon the work of a small group of quality pioneers: Dr. W. E. Deming, Dr. J. H. Juran and P. B. Crosby. There is agreement both within the public and private sectors concerning the meaning of TQM. In U.S. DOD, TQM has been defined as:

. . . a focussed management philosophy for providing the leadership, training, and motivation to continuously improve an organisation's management and operations. (DODD 5000.51-G)

A similar TQM definition from the private sector perspective is:

. . . a strategy which is concerned with changing the fundamental beliefs, values, and culture of a company, harnessing the enthusiasm and participation of everyone, whether manufacturing or service oriented,

towards an overall ideal of "right first time".  
(Atkinson and Naden, 1989:6)

### Principles and Practices

Central to TQM implementation is the development of awareness about TQM principles and practices. Management understanding of fundamental concepts that shape and guide TQM is essential before successful long-term improvements can be initiated. Deming has published 14 guidelines for management to act as a framework for improvement changes.

These are:

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.
2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.
3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
4. End the practice of awarding business on the basis of price tag. Instead, minimise total cost.
5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
6. Institute training on the job.
7. Institute leadership. The aim of supervision should be to help people and machine and gadgets to do a better job.
8. Drive out fear, so that everyone may work effectively for the company.
9. Break down barriers between departments.

10. **Eliminate slogans, exhortations and targets for the workforce** asking for zero defects and new levels of productivity. Creates adversarial relationships. Substitute leadership.

11. (a) **Eliminate work standards (quotas)** on the factory floor. Eliminate management by numbers, numerical goals. Substitute leadership.

(b) **Eliminate management by objectives.**

12. (a) **Remove barriers** that rob the hourly worker of his right to pride of workmanship.

(b) **Remove barriers** that rob people in management and in engineering of their right to pride of workmanship.

13. **Institute a vigorous program of education and self improvement.**

14. **Put everyone in the company to work to accomplish the transformation. The transformation is everybody's job.** (Deming, 1986:23-24)

The economic challenges of today's technologically advanced society insist organisations continually change to remain competitive. Deming's management guidelines summarised above are one set of principles for creating an environment of cooperative interaction between organisational elements. While other authors have submitted additional helpful pointers for managers of the 1990s, the important issue is that management has a commitment to transforming the total organisational culture through a structured, disciplined methodology which unifies the enterprise and at the same time improves all processes. Management must adopt practices which promote continuous improvement by keeping clear communication channels with staff, and stimulating innovative ideas from all levels within the organisation.

## Tools and Techniques

TQM utilises various tools to assist in the continuous improvement process. The use of statistical management techniques provides a method of timely, direct communication with a process and allows an accurate assessment of productivity and quality improvements (Siegel, 1982:1). Most basic statistical techniques can be used to measure any process in an organisation, and are tools for understanding variations in the process. Statistical Process Control (SPC) procedures are essential building blocks for successful TQM implementation. Dr Deming submits there are seven basic statistical charts which may be used as tools for improved operating efficiency. A brief discussion of the tools follows:

Cause and Effect Diagram. Cause and effect analysis is used in brainstorming sessions to examine the factors that may influence a given situation (Walton, 1986:99). The diagram shows relationships between "effect" and its "causes".

Flow Chart. Flow charting is a useful technique to identify and clarify the logical steps of a process.

Pareto Chart. The Pareto chart is a way to address the causes that have the greatest impact on the effect (Houston and Dockstader, 1988:18).

Run Chart. The run chart is constructed to determine if there are time-related patterns in process performance (Houston and Dockstader, 1988:20).

Histogram. A histogram is used to display the frequency of some event compared to other events.

Scatter Diagram. A scatter diagram is often used to chart the relationship between variables (Walton, 1986:111).

Control Chart. A control chart is useful for analysing processes and predicting how a process should perform under stable conditions (Houston and Dockstader 1988:20). There are various types of control charts depending on the nature of the process and the type of data collected.

The appropriate statistical method depends on the product, process, workforce and environment (Seigel, 1982:15). Utilised correctly by management, statistical tools have additional advantages beyond that of measuring quality. According to Seigel, charting can improve communication and morale. Use of charts can require staff to discuss concerns, and personnel may be more motivated by viewing the quality of their efforts (Seigel, 1982:15).

### Implementation Issues

Many approaches exist to implementing a quality improvement program such as TQM. To attain a better understanding of the factors that contribute to successful implementation, key elements or characteristics associated with a quality improvement implementation are identified and barriers to organisational change are discussed.

Metz has identified three organisation approaches to implementing productivity and quality improvements:



(1) productivity/quality programs, (2) quality of work life programs, and (3) organisational redesign programs (Metz, 1984:304). Metz argues the most difficult to implement, but the most likely approach to succeed is the organisational redesign (Metz, 1984:304). According to Landau, this approach requires a systematic strategic plan which inherently changes the organisation's way of doing business. In contrast, the first two approaches may introduce additional "new programs" and require employee cooperation, but the overall functioning of the organisation does not change (Landau, 1988:2). The third approach will continue to stimulate system improvements in the long term, whereas the other approaches tend to aim at productivity improvements quickly and are considered short term programs (Metz, 1984:309). Accordingly, continuous quality improvements are only likely to be achieved when both structural and attitudinal/behavioral changes are made to an organisation (Landau, 1988:5; Metz, 1984:313).

To assist the introduction of TQM at United States Naval Aviation Depots, Landau in his paper "Total Quality Management as an Organizational Change Effort: Implementation Requirements" developed six major implementation elements to guide the implementation. Each category is described below and references additional published research.

Top Management Orientation. According to Landau, management must have awareness and commitment to the

philosophies and activities of quality programs. Gaining awareness is considered the easier element to achieve as most managers see the benefits of organisational improvement. Commitment on the other hand, is more difficult to secure because it requires management to re-prioritise resources and can affect the social, structural and political aspects of the organisation (Landau, 1988:6).

Support of Total Involvement. Commitment and involvement must begin at the top and flow down into the organisation (Mansir and Schacht, 1989:4.114). Total involvement of all people in the organisation is critical for successful implementation. Known as participative management, involving employees in the problem-solving and decision-making process can significantly increase commitment to organisational goals and improve quality of work performed (Lindsay, 1989:78). Involvement and participation by every employee in the organisational change helps reduce resistance to that change.

In addition to introducing the concept of employee involvement, an organisation should also proceed to redesign its culture (Metz, 1984:311). Linkow says "Before embarking on a total quality revolution, an organisation must determine whether its culture offers an environment that is conducive to total quality" (Linkow, 1989:69). The culture of an organisation consists of the values and beliefs the members of an organisation corporately share (Linkow, 1989:69). An organisation with a total quality culture has

such values as customer service and total employee involvement driving quality behavior. Changing an organisation's culture may be necessary to provide a platform for quality improvement.

Structural Change. After awareness and commitment, Landau's second phase consists of changing the structure of the organisation. Successful application of TQM requires the cooperation and coordination of all organisational levels. Teamwork is viewed as a key facilitator for change in process improvement programs. One organisational structure commonly used to utilise teams in the improvement process involves three levels: an Executive Steering Committee (ESC), Quality Management Boards (QMBs) and Process Action Teams (PATs). The membership and function for each of these elements are briefly described below:

Executive Steering Committee. The ESC is the highest level of management consisting of the organisation's top managers. The ESC identifies the organisation's overall quality improvement goals, provides the resources necessary to make changes and provides leadership to the improvement efforts.

Quality Management Boards. According to Houston and Dockstader, QMBs comprise cross-functional teams of top and middle-level managers who are jointly responsible for a product or service (Houston and Dockstader, 1988;6). Members from different hierarchical levels are necessary to facilitate vertical communication throughout the

organisation. QMBs typically are formed to address specific problems identified by the ESC, and they apply continuous improvement practices to analyse and resolve problems. QMBs organise and commission Process Action Teams (PATs) to assist in the improvement process.

Process Action Teams. PAT membership comprise participants from any hierarchical level who have a thorough knowledge in some aspect of the process under consideration. The PAT assists the QMB by collecting and summarising process data (Houston and Dockstader, 1988;6).

Training for all Levels. Landau's third implementation phase involves training to accompany the new philosophies, goals and organisational structure. Greebler and Suarez (1989;2) insist that central to TQM implementation is the development of quality awareness and education in the philosophies and processes of continuous improvement. Training can be conducted in a variety of forums including university courses, special seminars, on-the-job training; and should address improvement philosophies, problem-solving techniques and team interaction skills (Mansir and Schacht, 1989;4.25, Landau, 1989;8).

Quality Improvement Actions. Landau's next phase sees actual improvements developed and introduced. The process under consideration is examined, data collected and analysed, and new procedures documented.

System Expansion. The last phase consists of codifying and institutionalising process improvements. Strategic plans

are developed identifying other organisational elements which would benefit from the implementation, and training schedules written for the work groups affected by the changes (Landau, 1988;9).

Other writers have proposed similar strategic considerations to quality improvement. Earlier reference was made to Edmund Metz's discussion of implementation strategies. To assist management introduce quality improvement through the concepts of participative management and cultural change, Metz has identified four key steps to planning and organising a redesign. These include:

1. Definition of a philosophy. Management should develop a statement of what the organisation's philosophical principles and culture should be.
2. Definition of goals and values. Organisational goals should be clearly stated and communicated to all employees.
3. Organisation of a transition steering committee. Formation of a management steering committee builds management ownership for success and manages the transition from the present to the future.
4. Development of the strategic change plan. This plan encompasses all major systems e.g. structure and technology, and provides a focussed business strategy for managing a strategic redesign to a cultural system where high productivity and quality are a way of life. (Metz, 1984:311-312)

#### Models for Continuous Improvement

The above discussion of implementation issues addressed key considerations in the quality improvement process. Moreover, Landau's paper served both as a discussion of implementation issues and a strategy for TQM introduction

into elements of the US Navy. A closer view of continuous improvement models follows.

Implementation of TQM requires that management adopt a strategy for integrating the practices and procedures of improvement in an organisation. A model can provide an elaboration of the sequential stages leading to continuous performance improvement. Numerous models exist which examine the individual process improvement effort. Focusing on the processes used to create products and services is fundamental to continuous improvement. As TQM emphasises continual process improvement, an overview of three continual improvement models is given.

U.S. DOD Model. U.S. DOD has proposed a "Typical Performance Improvement Model" (Figure 1) to define generic guidelines for the continuous improvement process. The model consists of seven sequential steps (Draft U.S. DOD 5000.51-G):

- 1) Establish the Management and Cultural Environment. Management must create a new, more flexible environment and culture which will encourage and accept change.

- 2) Define the Mission. Every member of the organisation must know the purpose of his job, his customer(s), and his relation to others in the organisation for providing customer satisfaction.

- 3) Set Performance Improvement Goals. Improved performance requires improvement goals. These goals must

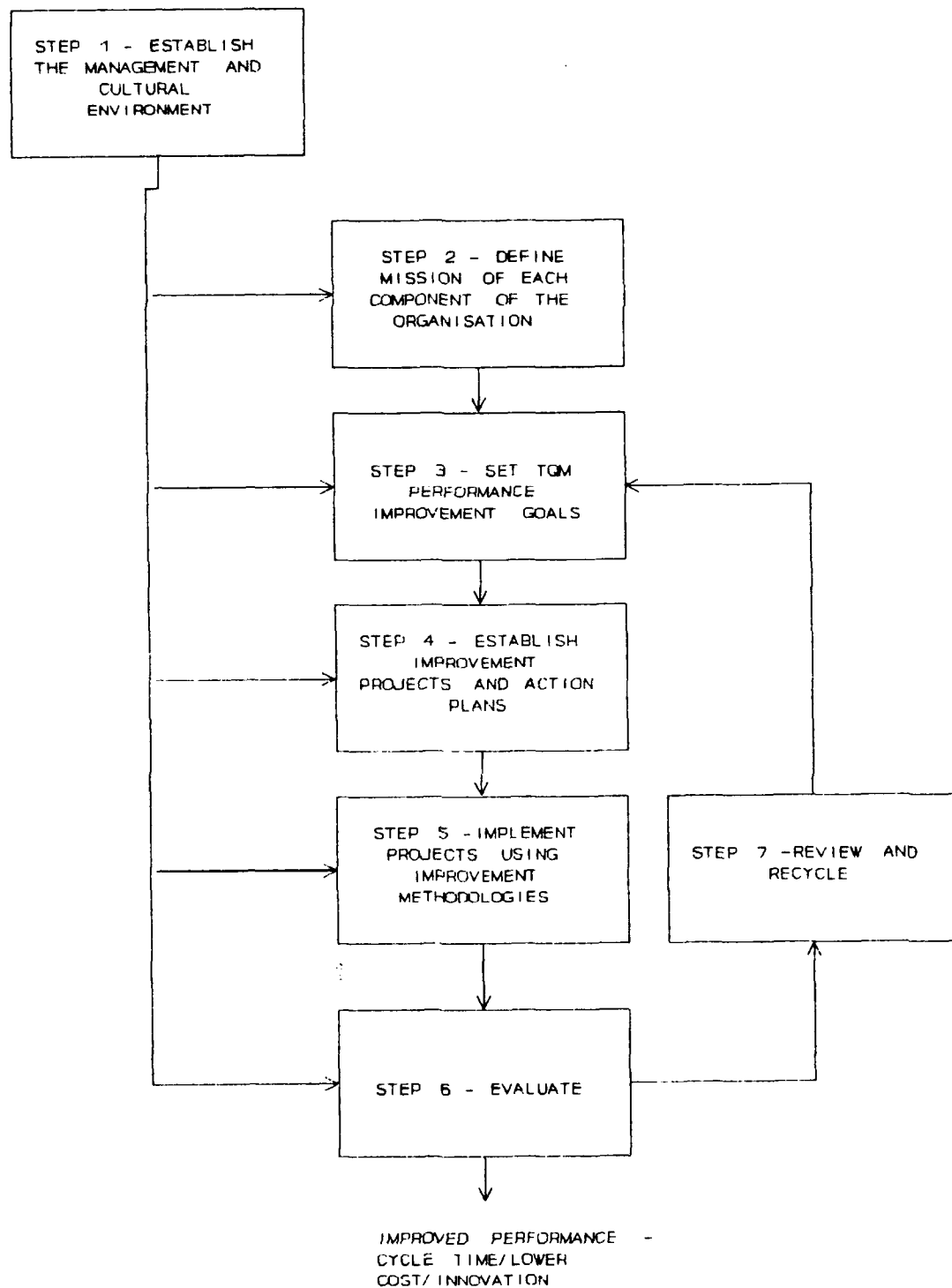


Figure 1. U.S. DOD Typical Performance Improvement Model (Department of Defense, 1989:14)

reflect an understanding of the process capabilities of the organisation so that realistic goals can be set.

4) Establish Improvement Projects and Action Plans. The initial direction and the initial goals for continuous improvement teams flow down from, and are determined by, top management.

5) Implement Projects with Performance Tools and Methodologies. Define the process and use performance measurement tools to analyse improvement opportunities and improve process quality.

6) Evaluate. A basic need in all improvement efforts is the ability to measure the value of the improvement in units which are pertinent and meaningful to the specific task.

7) Review and recycle. All employees will need to review progress with respect to improvement efforts and modify or rejuvenate existing approaches for the next progression of methods.

Mansir and Schacht Model. Mansir and Schacht have also proposed a Continuous Improvement Process (CIP) model consisting of three categories: (1) organisational transformation, (2) process improvement, and (3) individual improvement.

1) Organisational Transformation. According to Mansir and Schacht, transformation addresses the process of organisational change. The Mansir and Schacht CIP transformation model shown in Figure 2 focuses on the



organisational and behavioral changes required to produce and sustain a culture of continuous improvement in an organisation (Mansir and Schacht, 1989:5.1). Mansir and Schacht explain the model as follows:

Envisioning and Enabling. Envisioning is a process that involves developing the organisation's overall mission and goals and building individual and group awareness of CIP objectives, philosophy, principles and practices within the context of that overall mission. Enabling is the process by which management creates the environment to stimulate improvement. Leaders must show their commitment to CIP implementation and barriers to change identified and removed (Mansir and Schacht, 1989:5.2-3).

Focusing. Focusing the improvement effort is a process that turns the philosophy and the broad goals into specific objectives and plans for improvement. Broad top-level goals are translated into more specific, achievable, realistic goals relevant to both the group and the individual (Mansir and Schacht, 1989:5.3-4).

Improving. Improved processes are the result of envisioning a new way of doing business, enabling that vision, and focusing the effort to achieve specific goals and objectives. Performance and progress measurement are the dominant activities during this phase (Mansir and Schacht, 1989:5.5).

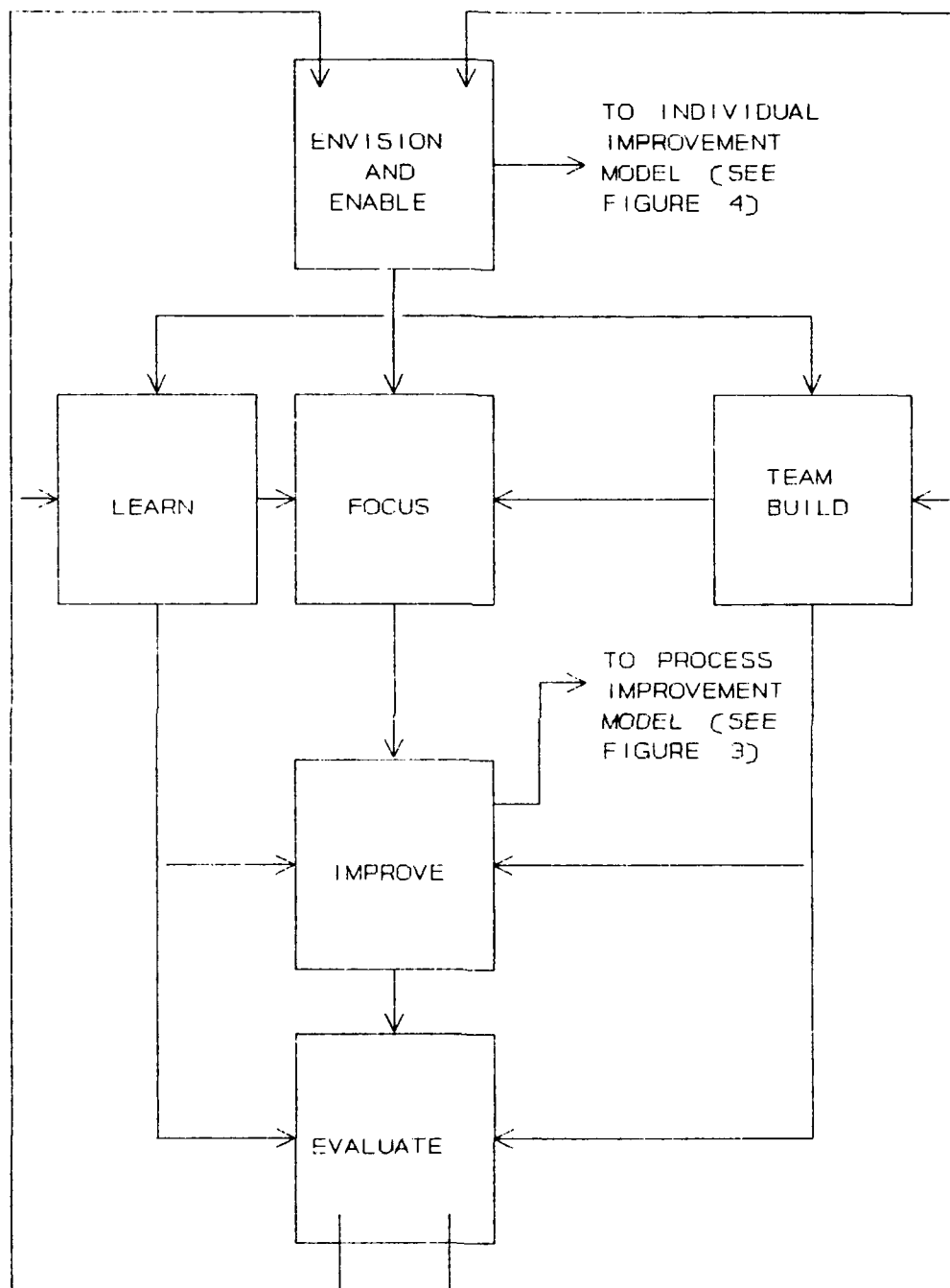


Figure 2. Transformation Model Framework (Mansir and Schacht, 1989:5.8)

Learning. The learning effort involves identifying projected needs from awareness through specific technical skills, determining how the education and training will be delivered, and providing the necessary materials and resources (Mansir and Schacht, 1989:5.5).

Team Building. CIP gains much of its power and momentum through the formation and activity of teams at all levels in the organisation. Teams should be formed according to the overall organisational goals and ensure that the teams have the necessary training resources and time to work effectively (Mansir and Schacht, 1989:5.6).

2) Process Improvement. Mansir and Schacht's CIP process-improvement model flows logically from the CIP transformation model. The model is shown in Figure 3 and consists of seven steps which address processes which are to be considered for improvement. Each step is discussed briefly:

Step 1: Set the Stage for Process Improvement. Preparing for process improvement requires that management first create an environment for improvement through activities such as education, goal setting, barrier reduction, and leadership (Mansir and Schacht, 1989:5.12).

Step 2: Select a Process to Improve. Select a process that presents the most serious problem or offers the greatest opportunity for improvement in support of organisational goals (Mansir and Schacht, 1989:5.14).

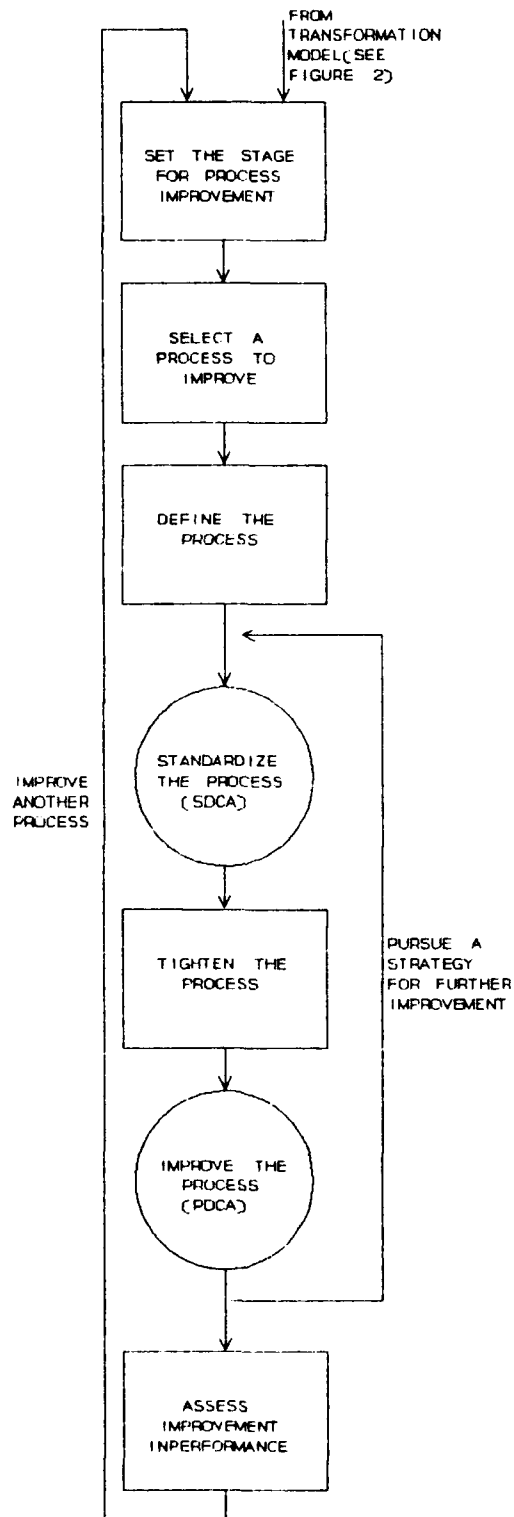


Figure 3. Process Improvement Model (Mansir and Schacht, 1989:5.13)

Step 3: Define the Process. Process definition involves determining the customers and the suppliers of a process, documenting how the process is currently performed, and identifying measures of process performance (Mansir and Schacht, 1989:5.14).

Step 4: Standardise the Process. Standardising a process institutionalises the current best way to perform a process, provides a means for evaluating performance consistently, and provides a basis for evaluating the success of the improvement efforts (Mansir and Schacht, 1989:5.14). This step is accomplished by following the Standardise-Do-Check-Act (SDCA) cycle. This TQM process improvement approach complements Shewhart's Plan-Do-Check-Act (PDCA) cycle (Houston and Dockstader, 1988:2). Both cycles are closely associated with Deming's philosophy of quality improvement.

Step 5: Tighten the Process. Before a process is improved, "maintenance work" is conducted such as eliminating unnecessary equipment, instituting total productive maintenance and ensuring reliable data-collection systems are in place (Mansir and Schacht, 1989:5.15).

Step 6: Improve the Process. Efforts to improve the process are guided by the PDCA cycle. Improvement plans are developed, teams implement solutions, process improvement is checked, and improvements are institutionalised (Mansir and Schacht, 1989:5.15). Organisational goals are identified during the "Plan" phase,

analysis of process variables that affect achievement of goals occurs in the "Do" and "Check" phases, and process improvements are made and evaluated during the "Act" phase of the cycle (Houston and Dockstader, 1988:1).

Step 7: Assess Improvement Performance. This last step involves documenting the process to improvement. Process definitions and flow diagrams are updated and process standards are rewritten to reflect the new standard of performance (Mansir and Schacht, 1989:5.15).

3) Individual Improvement. The third category of the Mansir and Schacht CIP model is individual improvement. The CIP individual improvement model is illustrated in Figure 4 and is also a seven-step iterative process.

It involves establishing a vision for an individual improvement effort and enabling that effort, focusing behavior and expectations to achieve continuous improvement in personal performance on the job and in the performance of others, and finally evaluating the efforts to improve. (Mansir and Schacht, 1989:5.20)

The Mansir and Schacht CIP model's list of activities is shown in Appendix B, and provides a detailed summary of the elements found in the model.

Theory of Constraints. Goldratt has developed a continuous improvement process model called the Theory of Constraints (TOC). Goldratt suggests using TOC to implement a Process of Ongoing Improvement, primarily addressing process inefficiencies in the manufacturing arena. In one sense, to reduce TOC to just a "model" possibly misrepresents its true purpose. Similar to TQM, TOC is

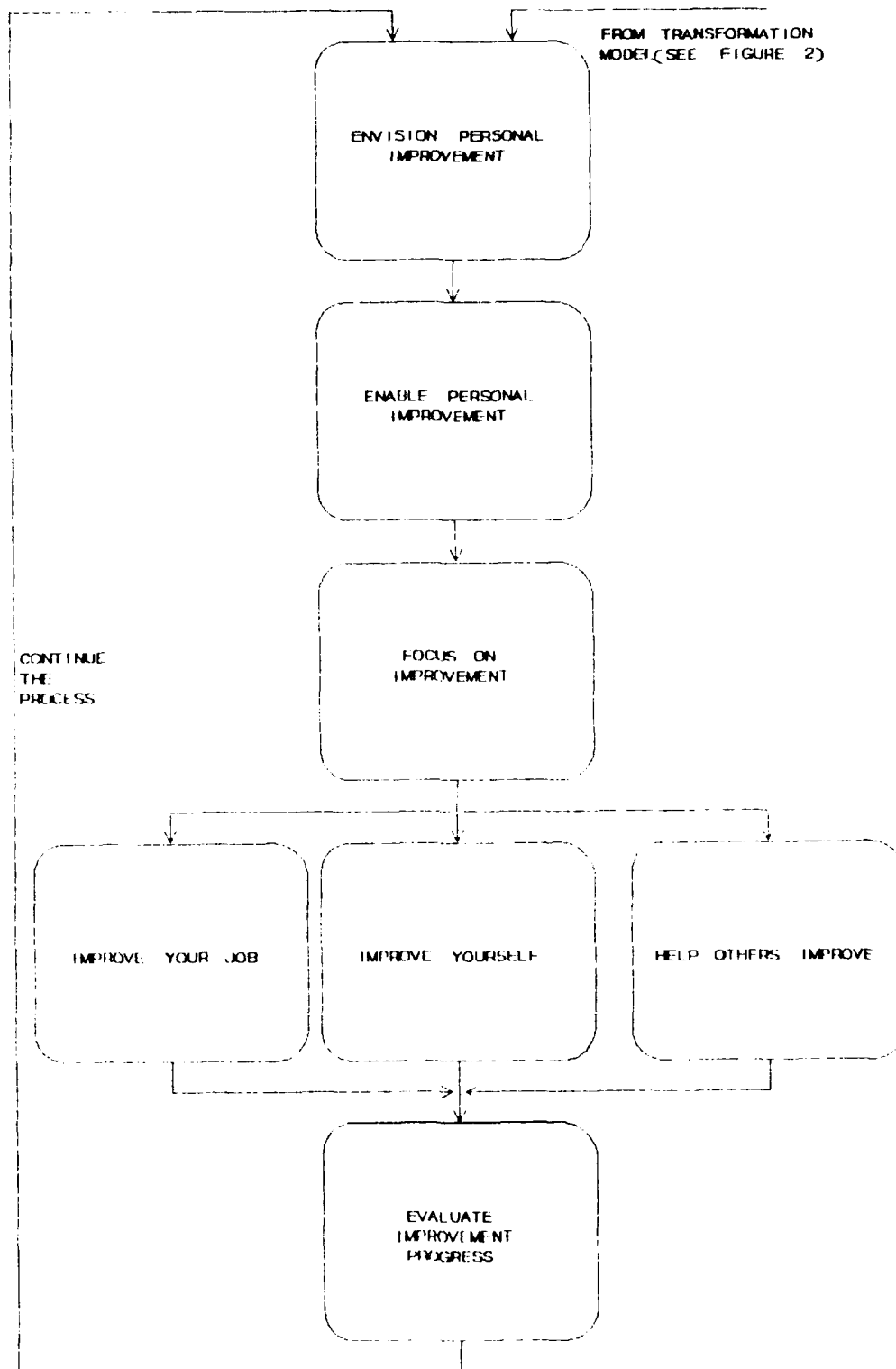


Figure 4. Individual Improvement Model (Mansir and Schacht, 1988:5.20)

really an overall management philosophy; however, in the context of this discussion, TOC will be referred to as a continuous improvement model. Actually, Goldratt does not distinguish between TQM and TOC, but views these approaches as having identical goals and promoting a similar management philosophy (Goldratt, 1990, 164).

First, the model seeks to lead the candidate through a process to find WHAT TO CHANGE. This requires an ability to locate core problems, rather than attack symptomatic issues. Goldratt argues improvement can only be "learned" and implemented through a deductive process. This should then lead to the question TO WHAT TO CHANGE TO, and construction of practical solutions. Finally, once the solution is known, the most difficult issue can be addressed...HOW TO CAUSE THE CHANGE. The 5 TOC steps which formalise this process are as follows:

- 1) Identify the system's constraints.
- 2) Decide how to exploit the system's constraints.
- 3) Subordinate everything else to the above decision.
- 4) Elevate the system's constraints.
- 5) If in the previous step a constraint has been broken, go back to Step 1, but do not allow inertia to cause a system constraint (Goldratt, 1990:16).

Goldratt does not present TOC as an isolated model for process improvement. Rather, he emphasises the need to implement TOC and the Process of Ongoing Improvement where change is not an exception, but a normal way of business. To



achieve this, Goldratt argues for a Socratic Method of education and training. He insists people have an extremely powerful intuition and can invent solutions to improve processes; however, change is routinely rejected by most people. The process that connects improvements to emotional resistance is as follows:

- Any improvement is a change.
- Leading to: any change is a perceived threat to security.
- Leading to: any threat on security gives rise to emotional resistance.
- Leading to: emotional resistance can only be overcome by a stronger emotion. (Goldratt, 1990:21)

Creative solutions are stimulated by reducing the perceived threat to security. Goldratt submits this is best achieved by convincing a person they have ownership of a problem. Once a person has accepted such ownership, that person is more likely to invent a solution (or a process improvement). Emotional resistance to that solution will diminish substantially, and therefore resistance to change will wane.

### III. Analysis of Case Studies

#### Introduction

Resurgence of a quality emphasis in Western industries has been stimulated by a reaction to the Japanese competition in international markets. Industries in the West are rapidly recognising the importance of the quality principles adopted by the Japanese. Private industries are not the only organisations rushing to adopt continuous improvement cultures. Production and service areas within the U.S. DOD have recognised the applicability of TQM in the government arena, and various agencies have made substantial quality progress. This chapter provides an overview of TQM developments in the U.S. DOD and U.S. military, with particular emphasis on the U.S. Air Force Logistics Command (AFLC) quality program.

#### U.S. DOD Commitment to TQM

The U.S. DOD community first began to implement TQM in the early 1980s. These efforts were significantly increased in 1987 as a result of the desire to achieve the productivity improvements sought under the 1986 U.S. Executive Order 12552. Executive Order 12552 challenged all U.S. federal agencies to increase productivity by three percent. The U.S. Secretary of Defense announced he was giving top priority to the U.S. DOD TQM effort. He issued a message on 19 August 1988 outlining his agenda for the TQM

program, stating that he wanted TQM applied to the acquisition of defense systems, equipment, supplies, and services to ensure continuous improvement of products and services being provided to, and by, the U.S. DOD (Springs, 1989:35).

The Secretary also announced to the U.S. military five "Salient Features" which serve as the five key features of TQM. They are: 1) prevent defects rather than detecting them after the fact, 2) focus on the processes which result in products and services, 3) continuous improvement of these processes, 4) innovation of new processes and products, and 5) application to all types of work (Springs, 1989:35). The fundamental principles that underlie the Department's TQM initiative were also published as the U.S. DOD Posture Statement on Quality, a copy of which appears at Appendix C.

The U.S. DOD further showed its upper management commitment to the TQM initiatives with the creation of a policy directive. U.S. DOD Directive 5000.51 establishes policy and assigns responsibility for TQM implementation. U.S. DOD Directive 5000.51-G is a guide to implementation and provides a seven-step sequential model for users. These steps are (U.S. DOD 5000.51-G, 1989:15-49):

- 1) Establish the management and cultural environment. This can be done by accomplishing the following: providing the vision for what the organization wants to be and where it wants to go; demonstrating a long term commitment to

change, even when change may be difficult or perceived to have high front end costs; actively involving all people in the improvement process, and encouraging and empowering people to be creative and make decisions within their area of expertise; using a disciplined approach using problem-solving tools to overcome problems and achieve progress; ensuring that the proper supporting structure is in place; and by training all employees in the benefits and techniques of TQM.

2) Define the Mission. The guide provides a nine-step procedure for defining the mission: identify the customers you serve; identify the requirements of your customers; identify the processes and resources used to satisfy the requirements; identify the products or services you provide to meet these requirements; develop measures of your output that reflect customer requirements; review the preceding steps with your customer and adjust as necessary; identify your principal inputs (labor, materials, products, services, etc.); involve your suppliers in the development of your requirements and obtain their conformance to them; and, define your mission with respect to the above steps.

3) Set performance improvement goals.

4) Establish improvement projects and action plans.

5) Implement projects with performance tools. This can be accomplished by first defining the process and identifying the customer and supplier requirements. Next develop and establish measures, assess conformance to

requirements and identify improvement opportunities. These improvement opportunities should be ranked and the process quality improved.

6) Evaluate the improvement efforts and identify areas for future improvements.

7) Review the progress made and then begin the process all over again.

In addition to the above U.S. DOD Directive, top management sought to provide a comprehensive document for all levels of U.S. Defense management to help understand TQM principles, and provide answers to questions on implementation. This document is known as the Total Quality Management Master Plan. The specific goals of this U.S. DOD plan are as follows (Department of Defense, 1988:3-10).

#### Long-Range

1) Establish TQM as a way of life. Ideally, TQM would cease to have its own identity and that the label TQM would eventually fade away from use as continuous improvement principles and practices become the normal way of doing business.

2) All U.S. DOD personnel directly doing continuous improvement.

3) Widespread industry implementation of continuous process improvement.

4) U.S. Congressional understanding of, and support for, TQM.

### Mid-Range

- 1) Establish and implement policy deployment mechanisms to provide a means for ensuring all defense elements are working to achieve a common set of goals.
- 2) Harmonise U.S. Directives/Regulations/Instructions and TQM.
- 3) Eliminate barriers to TQM. Those barriers include the policies, practices, regulations, laws, and attitudes that contradict the aim of continuous process improvement.
- 4) Implementation commitment by major defence contractors.
- 5) U.S. DOD Acquisition personnel use TQM principles and practices in dealing with industry.
- 6) Develop, produce, acquire, and promulgate a standard set of TQM training materials.
- 7) Establish a mature functioning staff of facilitators.
- 8) Understand and coordinate with TQM efforts by other sectors of the U.S. Federal Government.
- 9) Develop and cultivate key U.S. congressional TQM champions to ensure their support during changes in the U.S. DOD leadership.

### Short-Range

- 1) Establish executive steering committee and subordinate teams, commence training and begin continuous process improvement activities.

2) Identify initial cadre of TQM facilitators, and begin facilitating team activities and training staff facilitators.

3) Implement the TQM training strategy and begin collecting and developing training materials.

4) Establish an R & D program in support of TQM.

5) Develop and implement a recognition and reward system based on TQM goals and behaviour.

6) Begin ensuring consistency among TQM and major documentation and guidance.

7) Begin enlisting U.S. Defence industry commitment.

U.S. DOD TQM Training. Central to this master plan is an integrated education and training program, initially directed toward the acquisition work force. The U.S. Defense Systems Management College (DSMC) was assigned responsibility for the training and instituted a program. In the context of the program, education is concerned with the teaching of TQM principles and concepts; while training concerns the learning of skills and methodologies used in the application of TQM. The intent of DSMC's program is to institutionalise TQM within organisations through a continuing cycle of TQM education, training, and on-the-job applications (Greebler and Suarez, 1989:vii).

The DSMC has developed goals which will contribute to successful institutionalisation of TQM. The long-range goal is to educate the entire acquisition workforce, with personnel dealing with large defence contractors receiving

the most extensive TQM education and training. Mid-range goals are to train a critical mass of acquisition managers and set in place the training programs for TQM facilitators and statistical experts. Short-Range goals involve the finalisation of a TQM education and training strategy, and detailed plans that address training of course developers, facilitators, statistical specialists, and TQM coordinators (Greebler and Suarez, 1989:vii-viii).

To help DSMC develop the training program, the Navy Personnel Research and Development Center (NPRDC) reviewed the program in 1988 and made numerous recommendations. Many of the recommendations, such as the design awareness courses, have already been instigated. The NPRDC recommendations were:

1. Develop a management infrastructure for the TQM acquisition education and training program. Responsibilities will include reviewing and modifying this strategy and drafting specific action plans, identifying specific requirements for all TQM follow-on education and training, and coordinating inter- and intra-Service activities associated with training.
2. Identify issues related to funding TQM education and take programming and budgeting actions where necessary.
3. Educate course developers, instructors, evaluators, and facilitators.
4. Design awareness courses:
  - 1-day for senior management
  - 6-days for general management
5. Determine delivery agents and locations.
6. Conduct awareness courses; modify, package, and distribute.



7. Develop TQM follow-on training programs and programs designed to meet special needs of organisations.
8. Evaluate methodology for both individual courses and the overall TQM education program.
9. Establish a TQM resource center.
10. Integrate TQM education of U.S. DOD personnel and defense industry into public and private education systems in addition to using government sources of education.
11. Integrate TQM education and training into the professional development of U.S. DOD employees.
12. Conduct research on the most effective and efficient means of educating senior management in TQM. (Greebler and Suarez, 1989:16)

#### TQM in the U.S. Navy

The U.S. Navy officially recognised the need for a TQM program following the U.S. DOD's push for productivity improvement in 1987. The Navy had, however, been investigating ways to achieve productivity improvements since the early 1980s. Furthermore, numerous elements of the organisation had already designed and implemented quality programs.

Following the establishment of a high-level steering group and an organisational structure for quality issues, high-level productivity workshops were conducted to identify specific barriers to the implementation of a department wide quality program. The "roadblocks" identified included: system and tradition encourage status quo; bureaucratic barriers to effective management; need for top-level "champions"; no clear, cohesive, compelling long-range

vision and plan; diffused focus on what's important and how to measure success; and finally, lack of incentives to improve productivity (Springs, 1989:71).

Once barriers were identified, a high-level TQM implementation plan was developed to be executed within the U.S. Navy and U.S. Marine Corp. The purpose of the plan was to provide guidance for TQM implementation as the primary means of achieving continuous performance improvement.

Several organisations within the U.S. Navy have already implemented quality programs. A few such efforts are detailed below.

Naval Aviation Depot--North Island, California. The Depot initially introduced a TQM awareness phase from 1980 to 1984 and trained upper management in Deming techniques and general quality philosophies. Following a consultant's review in the 1985, momentum increased and a TQM "organisation" was established consisting of an executive steering committee, quality management boards and process action teams.

Depot management have reported considerable productivity gains as a result of the program, particularly in the administrative and engineering areas (Warmington, 1988:32). Such achievements, however, were not gained without encountering numerous problems. The foremost lesson learned was the over-emphasis on SPC techniques at the expense of reforming the Depot's culture. Other significant lessons learned were the need for upper and middle

management commitment, TQM training at all levels, and the need for a pool of facilitators before expanding the implementation process (Warmington, 1989: 41-42).

Naval Aviation Depot--Cherry Point, North Carolina.

The first efforts of the Cherry Point naval facility to establish a total productivity program have resulted in significant changes to the way naval aviation depots will accomplish their mission in the future. The establishment has adopted an improvement initiative aimed at using a TQM organisational structure, TQM tools and techniques, and advanced technology applications (Fargher, 2). Moreover, employee involvement has been emphasised by using a gainsharing scheme to share the financial benefits of employee's process improvements.

Naval Shipyard--Pearl Harbor. The Pearl Harbor shipyard adopted a Deming style TQM strategy and methodology in 1986 in an effort to be more productive and competitive. The goal of their program is to involve all employees in the continual pursuit of quality improvement in shipyard processes. This new management style is modeled by top management, including the steering committee, down into each department and shop. Regular meetings at all levels define, prioritise, quantify and flowchart problems. "Management Teams" implement changes and track and monitor the performance of process changes (Damon, 1988:116-118).

### TQM in the U.S. Army

As with the U.S. Navy, a formal U.S. Army quality management program was not launched until after U.S. DOD's posture on quality was announced. Nevertheless, the U.S. Army moved quickly to develop the Army Total Quality Management Implementation Plan in late 1988 (Springs, 1989:81). The Secretary of the Army and the Chief of Staff, Army, both showed a firm commitment to TQM implementation and issued a joint message on the U.S. Department of the Army Posture on TQM. Top management commitment was also evidenced by the adoption of an infrastructure to oversee the improvement program. An Army Total Quality Management Committee was established with steering committees being created at Command levels. Functional work groups were also established at Command level to address specific issues, products or processes (Springs, 1989:84).

Examples of TQM-related programs that are currently underway in the Army include: reliability, availability and maintainability initiatives; computer-aided acquisition and logistics support; value engineering, concurrent/producibility engineering, and integrated logistics support (Springs, 1989:91-92).

### TQM in the U.S. Air Force

In response to the U.S. Secretary of Defense's posture on quality, the Chief of Staff, and Secretary of the Air Force communicated their support of TQM exhorting all

Commanders to become involved in the quality emphasis (Springs, 1989:47). In addition, oversight of Air Force TQM was delegated to the office of the Under Secretary of the Air Force. Headquarters USAF is currently producing an implementation plan which will detail TQM requirements of each Major Command, and require Commands to provide a detailed appendix to the U.S. Air Force Plan of TQM developments.

Notwithstanding the fact that a formal Air Force wide program is yet to be released, a number of individual continuous process improvement programs have already been developed in the Service. A few significant related programs are identified below.

Logistics and Engineering Development. R&M 2000 is a program developed in the mid-1980s to increase system reliability and maintainability by using modern engineering and production technologies. Emphasis is on integrating statistical process control with other techniques aimed at producing reliable products and manufacturing processes which are responsive to customer requirements.

Air Force Systems Command (AFSC). AFSC commenced the development of a quality program in response to higher management encouragement in 1988. A Corporate Board of Directors was established to develop a corporate vision, a set of goals to structure the quality effort and to outline training needs.

Within AFSC, Aeronautical Systems Division (ASD) has made the most significant TQM progress. As a result of seeing the benefits of a TQM program operating in two of ASD's contractors, ASD developed their own program--called TQ (Total Quality). ASD has a unique framework for the program utilising a committee structure. At the heart of the framework is the TQ team, made up of a cross section of people within ASD's two-letter organisations. The TQ team's charter is to establish and operate three key subsystems:

- 1) The Search and Opportunity system, which capitalises on employees ideas for improvement of processes;

- 2) The Measurement system that gauges progress and provides focus; and

- 3) The Corrective Action system which uses teams to solve problems surfaced by employees and the Steering Committee (Baker and Rogers, 1989:2).

Critical Process Teams investigate and improve processes the Steering Committee identify as problems for the organisation. In addition, Corrective Action Teams may be appointed to assist the process improvement activity.

ASD emphasises the need for process improvement training for all levels in the organisation. The ASD training events conducted include Executive Action Workshops and Manager Action Workshops, and courses for Total Quality Teams, Critical Process Teams, and Corrective Action Team Leaders (Alexander, 1988:1655).

ASD has recorded numerous successes in their TQM endeavour. The Propulsion System Program Office Executive Steering Committee, for example, directed a Critical Process Team to investigate the excessive time required to fielded hardware. The Team, comprising personnel from both ASD and outside organisations, broke the process down into 11 subprocesses, and then systematically identified 38 significant improvements which resulted in an estimated 40% reduction in calendar time and 20% reduction in manhours (Alexander, 1988:1658).

Successes notwithstanding, the organisation has also reported numerous lessons learned in their program. Alexander argues first and foremost is the need for top leadership commitment and involvement. Furthermore, employees at all levels in the organisation must be kept informed of progress and successes. Also, the first processes to be analysed should be those that have been causing problems and frustration. Employees are then encouraged to get involved in the action teams. Participating in improving the process creates a sense of ownership and commitment. Another important lesson learned has been the need to discourage program implementation prior to the formal training. Premature implementation and program collapse could alienate employees and discourage them from further involvement. Lastly, ASD have highlighted the need for TQM implementers and facilitators to be prepared for negative comment and employee resistance to change.

Understanding and acceptance of change takes time  
(Alexander, 1988:1659-1660).

Air Force Logistics Command (AFLC). TQM initiatives at AFLC were first introduced in 1987. Following an unsuccessful search for an existing quality program to tailor to the AFLC organisation, the Commander embarked upon the development of a quality program unique to AFLC. In November 1987, the AFLC Commander, General Hansen (now retired) stated ". . . the challenge for AFLC in terms of supplying combat capability will increase substantially in the years ahead. For us, one of the paramount elements in providing Combat Strength Through Logistics will be quality..." (Hansen, 1987:1).

General Hansen emphasised the need for top-down involvement in the quality effort. His "cascading" principle sought to ensure quality programs start at the Commander level, and flow down through subordinate directors, executives, division and branch heads to employees at the lowest levels of the command.

To facilitate a quality philosophy throughout the command, and to encourage all members to assimilate new work habits, a Quality Bill of Rights was developed and distributed across the Command. Every employee would have the following rights: 1) The right to challenge business as usual. 2) The right to be heard. 3) The right to expect commitment to quality. 4) The right to place quality before



production. 5) The right to feel genuine pride in AFLC products and services (Brownlee, 1989:39-40).

The main strategic tool used by the U.S. AFLC to introduce continuous process improvement throughout the command is the QP4 program. The title QP4 was derived from the initials Q for quality, and the four Ps for the interdependent components of quality: People, Process, Performance, and Product. QP4 is designed to accomplish the following:

1. Process Improvement: A way to apply the knowledge and experience of the workforce to improve the way things are done.
2. Customer satisfaction: An emphasis on meeting the expectations of the customers.
3. Doing More With Less: AFLC's response to DOD's challenge to accomplish the mission effectively while facing budget cuts.
4. Participative Management: A management philosophy that recognizes the individual worth of workers and solicits their input.
5. Statistical Process Control: Applying statistical tools and techniques to analyse the systems where we work.
6. Job Security: Ensuring the capability to deliver the desired level of quality in product or service in a competitive environment.
7. Team Concepts: Working as a team to achieve common goals.
8. Increased National Defense: Instilling quality in our basic processes and workforce to ensure responsive and productive logistics support (Warner Robins ALC, 1988:3).

The command also created a Strategic Implementation Plan (SIP) which provided broad guidelines to assist Air

Logistic Centers (ALCs) implement their own QP4 type program. The SIP consisted of 3 parts: SIP 88-3-1 defined strategic QP4 objectives and associated issues, SIP 88-3-2 addresses education and training issues, and SIP 88-3-3 outlined manpower and funding requirements. All centers were allowed their own quality structure, and to have the flexibility to develop strategies unique to their own processes (Springs, 1989:59). All QP4 programs, however, were to broadly follow a process similar to the elements described below:

1. Identify processes needing improvement.
2. Assign process owner for each process.
3. Assign Process Action Team (PAT) members including internal and external customers and workers.
4. Select a technical advisor or facilitator.
5. Train the owner and the team members in:
  - a. Problem solving.
  - b. Interaction skills.
  - c. Statistical Process Control.
  - d. Data Collection.
  - e. Data display techniques.
6. Establish PAT meeting frequency.
7. To begin the process analysis:
  - a. Define the process.
  - b. Flowchart the process.
  - c. Identify customers and their needs.
  - d. Identify and prioritise key pulse points.
  - e. Collect data and measure performance.
  - f. Determine cause and effect relationships.
  - g. Verify cause and effect relationships.
  - h. Make changes to improve manpower, methods, material, machines, environment etc.
  - i. Document the improved process.
  - j. Control the process (use statistical process control) (Warner Robins ALC, 1988:4).

Nearly two years after promulgation, success of the U.S. AFLC Strategic Implementation Plan has been limited. A number of ALCs have developed successful programs, yet ignorance and resistance still exists at many locations (Doherty, 1990). Major Steve Doherty, USAF, Deputy Assistant to the Commander for Quality, believes training and a tighter implementation plan should enhance command wide QP4 success (Doherty, 1990). A revised AFLC Strategic Implementation Plan (SIP) 3-1 has been issued, and replaces the first version SIP 3-1, 3-2, and 3-3. AFLC Strategy 3-1 now provides specific considerations and tasks in the execution of the QP4 program. The SIP also provides a roadmap to implementation. The following five phases are important to AFLC for the purpose of planning and understanding organisation wide deployment. These phases are (AFLC, 1989B:4):

1. Readiness Phase. This phase is marked by variation in understanding of continuous quality improvement, and its relevance to the individual and organisation.
2. Resistance Phase. Although resistance is encountered in every stage of implementation, this phase will normally be encountered at the end of the initial introduction to continuous quality improvement.
3. Expansion Phase. Critical mass of QP4 will be achieved through reduction of long-standing problems. This will serve to inoculate QP4 as a work ethic and reduce further resistance as converts take up the QP4 process in their work areas and breed more success.
4. Integration Phase. In this phase the QP4 ethic will be incorporated into daily routines.

5. Regeneration Phase. Organisations will appear to be "reborn" as cultural transformation, promised by QP4, become a reality. Organisations will be aligned, horizontally and vertically, in pursuit of strategies aimed at continuously improving mission effectiveness.

Education and training of AFLC employees is essential to the success of QP4. A TQM Training Planning Team (TPT) was established to plan, organise, coordinate, direct, and control the TQM training development and implementation effort (AFLC, 1989A:17). To guide their efforts, a TQM/QP4 Training Development Plan was initiated and contains a model for continuous employee TQM education and training. The model is divided into three phases: Planning, Development, and Implementation. The planning phase is designed to determine training program goals, survey existing training, identify resource requirements and determine schedules (Doherty, 1989:1481). The development phase consists of training analysis and course development. The skills and knowledge required to perform TQM duties are selected (Doherty, 1989:1481). In the implementation phase, courses are conducted and maintenance of the curriculum is managed (Doherty, 1989:1481).

AFLC is in the latter stages of the planning phase and have identified six initial TQM general education and training areas and five TQM support tools. The areas are: general workforce, first line supervisors, middle management, senior management, executive management and TQM facilitators (Doherty, 1989:1482). The TQM tools include: Statistical Process Control, Process Action Teams, Design of

Experiments, Value Engineering and Quality Function Deployment (Doherty, 1989:1482).

#### Acquisition Logistics Division

The Acquisition Logistics Division (ALD) was formed on 1 July 1976, as a division of AFLC, with its mission ". . . to reduce long term costs of ownership and operational support of weapon systems and related equipment . . ." (Kallander, 1989:1). Numerous changes occurred to the organisation's structure and mission during the subsequent decade to better reflect changing in logistics policies. The current ALD mission is ". . . to provide logistics project management, engineering and technical analysis, as well as centralized and concentrated logistics expertise . . ." (USAF Fact Sheet, 1989:1).

The ALD quality program is a derivation from the AFLC QP4 quality program. The nature of the acquisition business is management operations, with a "service" offered to other organisations rather than a "product". The main objective of the ALD quality program is to improve acquisition logistics processes by which data and information are generated and used to make decisions (AFALC, 1988, 1). The program seeks to improve the processes by which information is generated.

The quality program was designed around a top-down, bottom-up approach. The ALD Quality Council exists to provide top-down management input by prioritising processes and activities. The bottom-up aspect is individual employees providing improvement ideas through their superiors.

Responsibility for implementation and control of the program rests with the two-symbol office chiefs (AFALC, 1988:2).

In addition to the Quality Council, the program structure includes Process Evaluation Teams (PETs), Process Action Teams (PATs), and People's Ideas (PIs). The PET is formed by office chiefs to evaluate broadly defined processes. The PET leader is selected by the office chief, but individual PET members are selected by the leader. PATs are ideally formed as a result of PET findings and recommendations. Membership is selected similar to the PET, but may not remain in existence as long. PATs focus on narrowly defined improvement opportunities or problems (AFALC, 1988:2). PIs are the vehicle for individual inputs and normally relate to a recommended improvement opportunity, problem, or change in work environment (AFALC, 1988:3). PIs ideally complement the quality program and provide input into the PET and PAT activities.

Subsequent to the Quality Program Plan being approved by the ALD Commander, the organisation set about designing a strategic plan for program implementation. The Office of Assistant to the ALD Commander for Quality, and consultants from the U.S. Air Force Institute of Technology, initiated a two-day session of planning meetings in early 1989 to establish and review the organisation's strategic direction. The meeting attendees consisted of upper management in ALD--both military and civilian.

The meeting organisers adopted the AFIT's Quality Working Group's Roadmap to TQM - Milestone 2 (Appendix D) as a guide to the planning session. The purpose of the session, therefore, was to develop a comprehensive plan to integrate TQM into every aspect of the organisation. The desired outcomes from the meeting were for managers to understand their role in directing a TQM effort, to set goals, and to accept responsibility for integrating TQM into every aspect of ALD (Kent, 1989:34). At the conclusion of the two-day session, the management of ALD had agreed on its overall mission, the critical success factors required to accomplish it, and the key processes that must be mastered to accomplish those goals (Kent, 1989:41).

The ALD quality program has had only limited success. Following the strategic planning session, no plan was initiated to direct process improvement efforts throughout the organisation (Kent, 1989:44). This weakened the impact of the planning session and threatened the likelihood of organisation-wide TQM implementation. Deming stresses this point in his management principle #1: "Create Constancy of Purpose". Management must set the course to process improvement and provide a roadmap for implementation throughout the organisation (Scherkenbach, 1986:11). Furthermore, the ALD Quality Council does not meet regularly; resulting in process improvement initiatives coming only from motivated management and employees within any of ALD's two-letter organisations (Sharp, 1990). Also,

no formal feedback mechanisms were instituted for measuring progress. The AFLC QP4 staff hope to partly overcome such problems through the comprehensive AFLC Strategic Implementation Plan 3-1 (revised) discussed previously.

A further problem identified with implementation of the ALD quality program relates to insufficient training of PAT members and inappropriate tasks being assigned. PATs should seek to inject quality into processes using problem solving and analysis techniques. As of April 1990, sixty-four PATs had met in ALD, eighteen of which were still working. The Special Assistant for Quality at ALD, Mr. Tim Sharp, believes only a handful of these PATs have been successful in improving organisational processes. Most have been involved with specific functional tasks within their own organisation or taking action to improve the work environment. The reasons for overall PAT ineffectiveness is the inability of members to utilise appropriate TQM tools, and the PATs being formed to address "product" problems, rather than "process" issues (Sharp, 1990).



#### IV. Conclusions and Guidelines for TQM Implementation in RAAF

This chapter summarises the major findings contained in the literature review and case study analysis. From the knowledge gleaned from this historical research, TQM implementation guidelines are provided to assist the RAAF face the challenging task of introducing a "new way of management" throughout the organisation. The guidelines incorporate proven continuous process improvement techniques, and provide a roadmap with "signposts" to avoid the implementation pitfalls identified in some of the documented cases. Caution should be given to adopting these guidelines as a "checklist" for RAAF management to execute just a "program". While the framework presented does lend itself to a checklist implementation style, TQM must be more than a collection of buzzwords and steps. Instead, it should be viewed as an evolutionary and revolutionary on-going process.

The decision to adopt TQM in the RAAF should be recognised as a significant change in strategic direction. The guidelines offered in this chapter are the culmination of a literature search seeking understanding of the quality improvement movement, and provide a systematic set of actions to assist RAAF managers integrate the quality philosophy into strategic plans at every level of management.

## Conclusions

Economic and financial constraints are forcing many organisations, including the RAAF, to reach new levels of productivity and attain significant quality improvements. TQM, under various guises, is increasingly being accepted as the management philosophy most capable of increasing productivity.

One of the key characteristics of a successful quality program is top management orientation toward continuous process improvement. Participation and involvement must emanate from senior management, and cascade to lower organisational levels. A proof of genuine top-level devotion to a TQM philosophy will be organisational structural changes to support the construction and implementation of process improvements, and liberal allocation of the resources needed to implement the new philosophy. The U.S. DOD demonstrated its commitment with policy directives, new senior appointments, high level quality committees and adequate funding for quality improvement implementation.

Organisational change is not easily implemented. In many cases, an organisation's culture must be transformed before process improvements are possible. Managers must shift their focus toward satisfaction of customer needs, service toward their own employees, and participative management. Managers must understand the process of change and how it should be implemented.

Education and training are fundamental necessities of any quality improvement effort. Education begins with ensuring every person in the organisation is aware of the need for self-improvement, and the necessity of continuous process improvement in an organisation. Moreover, training personnel to identify and solve problems is at the heart of the improvement process. ALD was one organisation selected to highlight the need for up-front training. ALD instituted a quality program before providing PATs with the necessary problem-solving skills and consequently reaped only marginal process improvements.

The last significant finding concerns implementation strategies. The case analysis documented the limited success of U.S. AFLC's QP4 initiative, due mainly to loosely structured implementation plans. A more structured implementation approach within the command has now been adopted. Other organisations, similarly, are seeing the need for implementation strategies which are structured, yet flexible enough to accommodate specific organisational idiosyncrasies.

#### Guidelines for TQM Implementation in RAAF

The following set of guidelines serve to envelop any specific strategy adopted to implement TQM across the RAAF, and provides a logical context for implementing that strategy. The guidelines do not constitute a RAAF TQM implementation plan, but discuss important factors to

implementing and sustaining the quality initiative. A RAAF strategic implementation plan would detail specific organisational requirements, including time lines, reporting channels and budgetary information. However, fundamental issues that comprise a RAAF strategic implementation plan are briefly discussed.

The key elements of RAAF TQM implementation are presented at Figure 5. This diagram provides a convenient framework for explaining the process of achieving TQM in the RAAF. The five TQM components that must be addressed are: culture, management direction, organisation, people, and continuous process improvement. Each component is "exploded" in diagram form and explained below.

Culture. The real core of TQM is cultural change. Figure 6 displays the role of cultural change in RAAF TQM. This first element requires a general assessment of attitudes about the nature and purpose of the RAAF's work. Management must assess whether the RAAF's organisational climate is right for TQM implementation. If the environment is hostile to change, senior management must change the culture through leadership and education. Assistance in assessing the RAAF's current commitment to a quality culture should be provided by an experienced facilitator. An outside facilitator is able to view the organisation more objectively, and is better educated in the overall TQM process than any individual in the RAAF.

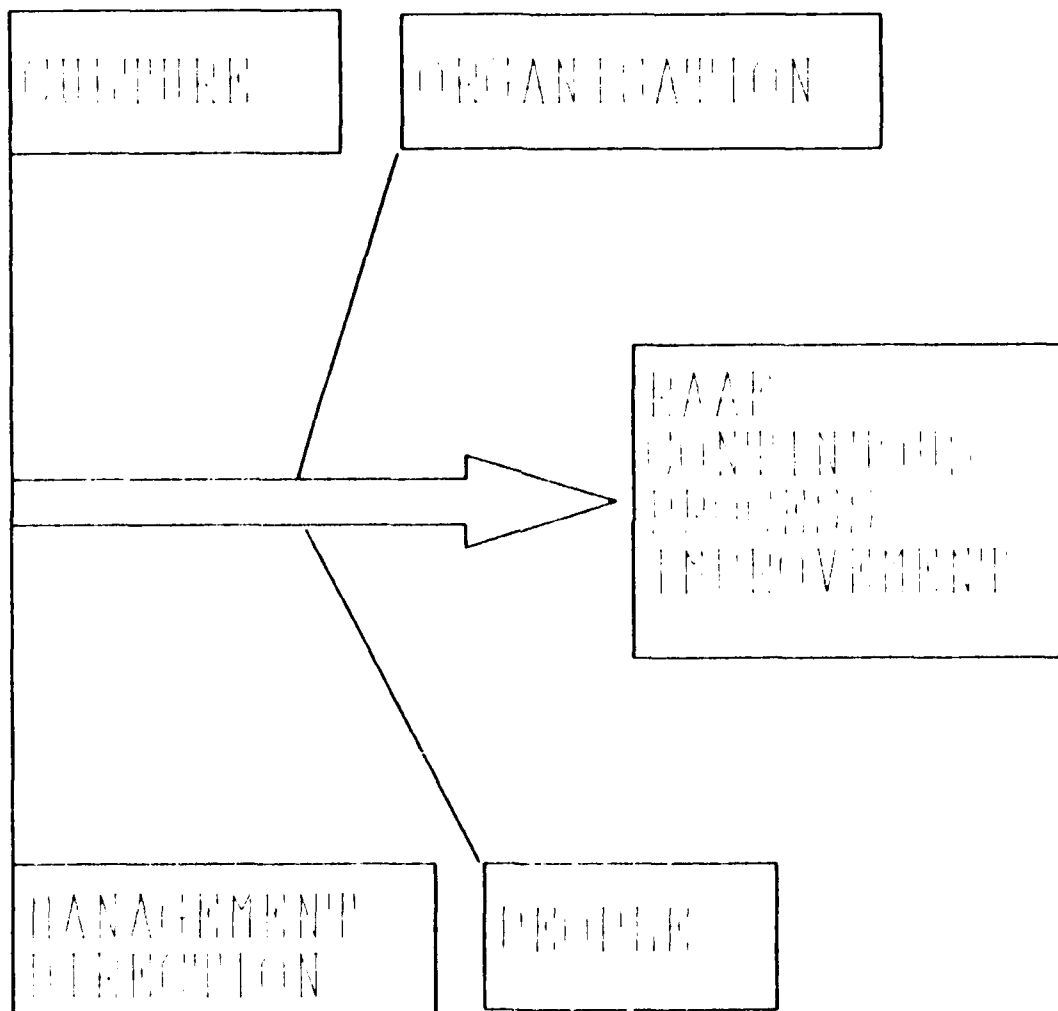


Figure 5. Framework for RAAF TQM

## CULTURE

ASSESS CURRENT RAAF CULTURE

IDENTIFY RAAF QUALITY VALUES

COMPARE RAAF QUALITY VALUES WITH  
THE CURRENT CULTURE

IDENTIFY THE DELETERIOUS EFFECT OF  
EXISTING MANAGEMENT SYSTEM VARIABLES

DEVELOP STRATEGIES FOR CULTURAL  
CHANGE

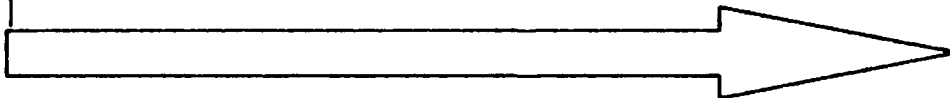


Figure 6. Culture and RAAF TQM

The organisation must generate its own quality "values" and commit to values such as customer satisfaction, employee satisfaction and involvement of employees. These values should succinctly describe the RAAF's quality objectives. Examples of the type of quality values the RAAF may adopt are as follows:

- 1) Provide top quality, as perceived by the customer.
- 2) Provide superior service.
- 3) Achieve extraordinary responsiveness.
- 4) Pursue fast-paced innovations.
- 5) Use self-managing teams (Peters, 1988:ix-x).

The RAAF's quality values will have a significant impact on the functioning of the entire organisation and should affect resource allocation priorities across the RAAF.

A current cultural assessment and establishment of RAAF quality values should be initiated and led by CAS and DCAS personally. This top-level involvement will send a message to the organisation that quality improvement is a high priority in the RAAF. Senior management should initially ask questions such as: How does working in the RAAF differ from working in another Service, government position, or private sector position? What quality problems do members experience? What are the obstacles to member's pride of work, teamwork and work satisfaction? What RAAF policies currently exist that thwart employee pride, satisfaction and creativity? This exercise will identify barriers to

implementation and expose excessively bureaucratic structures, outdated policies, and cumbersome change mechanisms. This assessment must carefully distinguish between change barriers, and necessary checks and balances built into processes.

Furthermore, this assessment should address management system variables which impact RAAF employee behaviour. The primary variable is the RAAF personnel system. For example, how does the posting and promotion structure impact behaviour and performance? Other variables affecting RAAF personnel performance are leadership style, management information systems and organisational structure. The RAAF must be committed to aligning and integrating management systems to support TQM initiatives.

Management Direction. RAAF managers must be aware, committed, active and involved in the TQM process. To achieve this implies a major cultural change in the organisation. True quality improvement cannot happen by decree, but must come by individual leader's personal commitment. Nevertheless, without top management support and strong leadership, lower levels of management can impede or stalemate the improvement effort--thus destining it to failure. Figure 7 diagrammatically represents the key activities of the management direction element of RAAF TQM.

Chief of the Air Staff (CAS) and DCAS Division must develop and promulgate a vision of what RAAF quality is to achieve, reflecting the organisation's quality values.



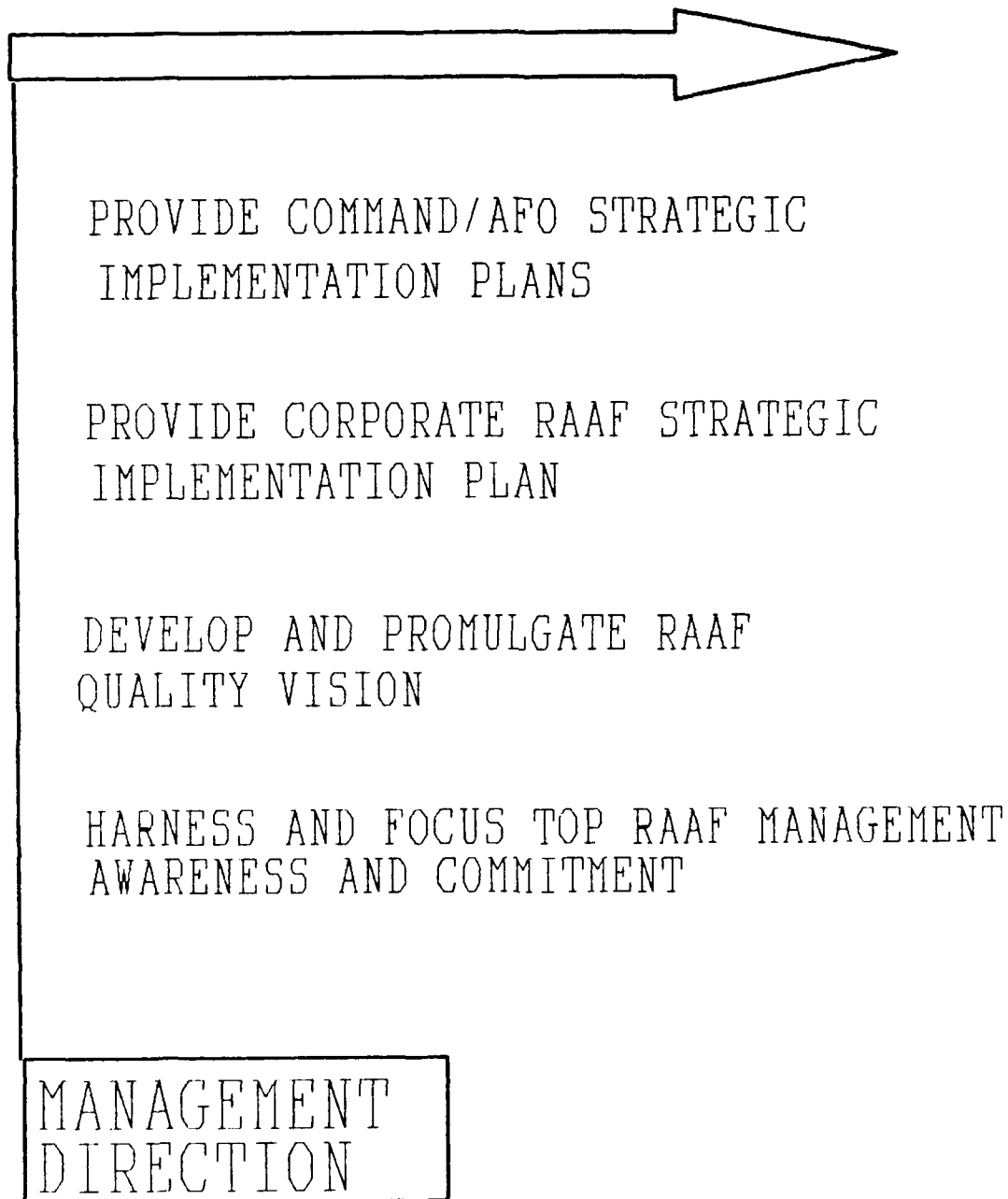


Figure 7. Management Direction and RAAF TQM

The vision should be consistent with the goals and objectives of the RAAF. This vision could be developed a number of ways; one approach is through a forum involving CAS and his senior leadership. A Defence Instruction and possibly other broad policy directives should explain the basic intent and purpose of implementing RAAF TQM. Top management involvement in TQM should not be limited to the preliminary phases of implementation. Senior management's daily calendar, on an ongoing basis, must reflect the commitment to the quality improvement effort.

Once sufficient senior leadership support is secured, the RAAF has quality values and a clear vision, strategic implementation plans can be developed for introducing TQM throughout the organisation. Both a corporate RAAF strategic implementation plan and specific command implementation plans should be developed. These plans provide the structure for a totally integrated effort toward improving performance at every level. Specifically, the strategic implementation plans identify major tasks, milestones, tactics, and resources needed to fully implement RAAF TQM. The corporate RAAF plan should ensure sufficient guidance and direction is provided to commands to develop their specific implementation plans. All strategic implementation plans should incorporate the purpose, background, scope, limitations, responsibilities, and execution requirements of the plan.

The execution guidelines of the higher level corporate RAAF strategic implementation plan should instruct tasks to be completed by Air Force Office (AFO) and commands, including timings for completion. The commands must incorporate these directives into their own strategic implementation plans, detailing their quality vision and quality objectives with appropriate policy letters and/or Defence Instructions. Each command's specific strategy should be congruent with, and integrated into the overall RAAF strategic quality plan.

Fundamental improvement goals should be developed outlining each organisation's long-term goals. In addition, more short-term objectives are derived, including quality objectives of each branch within AFO and the commands. Each strategic plan should also comment on infrastructure requirements such as manpower limitations and facilities. Budgetary guidance is needed, as well as direction on reporting responsibilities.

The RAAF strategic implementation plan must facilitate RAAF-wide adoption of TQM in a cost effective, integrated and structured manner. The plan must drive the whole organisation and yet be simple and easily understood. Adherence to the plan can only be achieved if the guidelines promote creativity and independence, yet avoiding the pitfalls of an overly loose structure. Commands must see the value of supporting the program, and be eager to embrace the

requirements for the sake of the benefits which will accrue to their own organisations.

Concurrent TQM implementation at all three RAAF commands and AFO should only be attempted if the improvement effort can be realistically sustained. Top management must initially ask such questions as: In which part of the RAAF should the transformation begin? What resources, financial and personnel, will be needed to sustain the quality effort at each level? A phased implementation is recommended if the total plan cannot be supported simultaneously, and only if active leadership exists in senior management.

Organisation. An organisational structure for the quality function must exist to support the quality goals of the RAAF, and an organisational strategy adopted that will manage the overall implementation of RAAF TQM. Figure 8 displays the suggested organisational elements of RAAF TQM.

A hierarchical-oriented structure of teams provides the basic means for RAAF personnel, at all levels, to become involved in continuous quality improvement. Moreover, it should facilitate communication flows between, and within all levels of the RAAF organisation. A suggested quality organisational structure is as follows:

- 1) CAS Quality Council. This group should consist of the RAAF senior management who currently form the Chief of the Air Staff Advisory Committee. The council should provide overall direction to the quality initiative and provide the vision, high-level quality objectives and program policy for

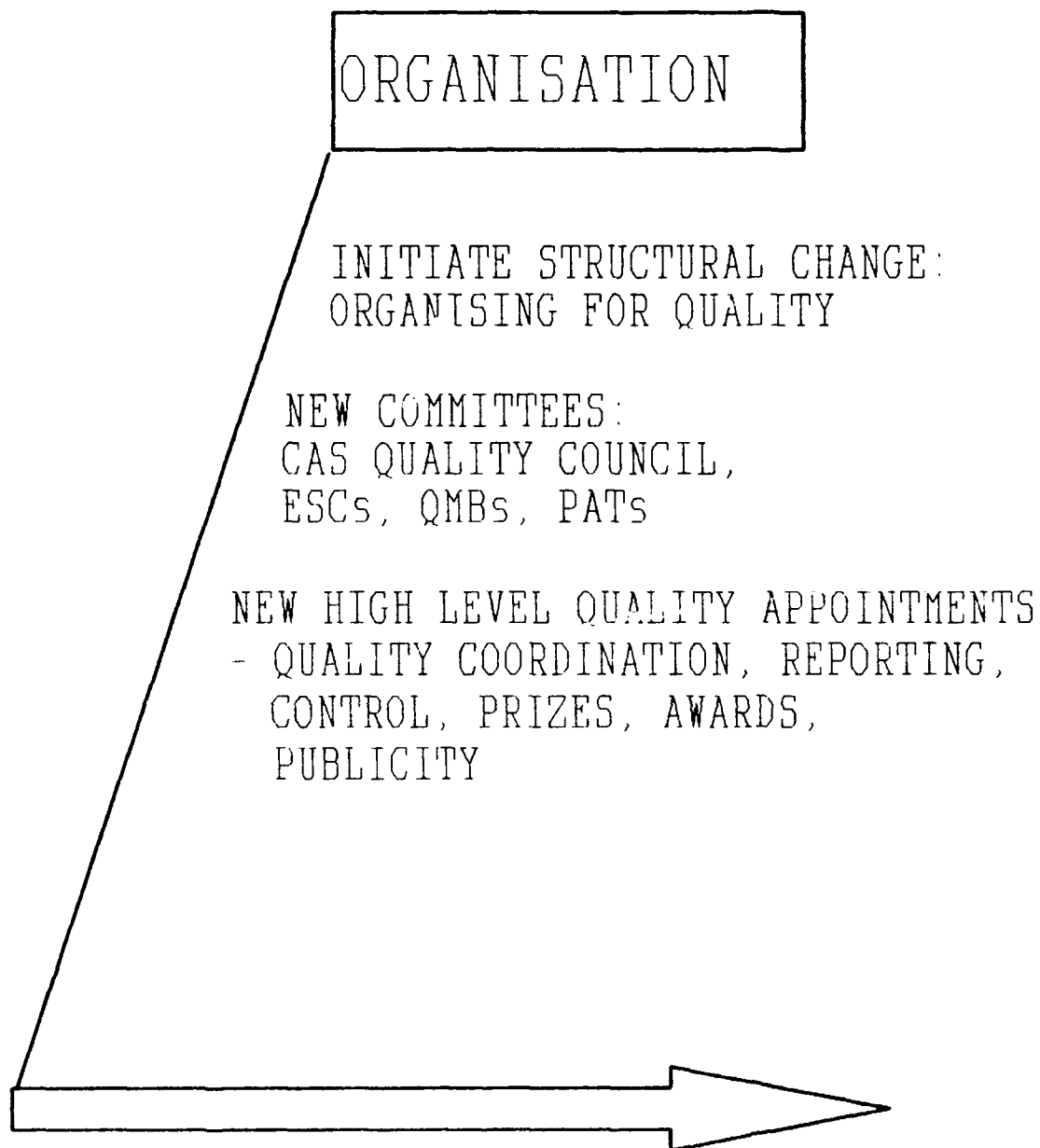


Figure 8. Organisation and RAAF TQM

the RAAF. This high-level committee ensures consistent application of the TQM process throughout the RAAF.

2) AFO and Command Executive Steering Committees. The next level consists of steering committees (or quality councils) designed to provide oversight and resource funding for the individual quality efforts at AFO and each command. These committees' function should be similar to the CAS Quality Council except the scope of the program is reduced. Each ESC also sets the quality agenda for their respective organisation. Membership of the committee should comprise senior management of those organisations.

3) Quality Management Boards. AFO and each command should establish specific QMBs comprising top and middle-level managers. The QMBs may exist at RAAF division, branch and directorate levels and are responsible for disseminating program policy/guidance, addressing quality issues raised by the ESCs, and commissioning and monitoring process action teams formed to investigate specific processes.

4) Process Action Teams. The PAT utilises specific tools and problem-solving techniques to improve processes earmarked by the QMB and ESC. They focus primarily on narrowly-defined improvement opportunities or problems. PAT membership should include participants from any level within the organisation.

This RAAF quality committee structure must be well integrated with consistent leadership to ensure focus does not drift to problems that affect a single organisation's

immediate product and their worklife. Focus must be maintained on improving RAAF processes.

In addition to a quality committee structure as presented above, specific higher level quality appointments should be considered at AFO and commands. These appointments should be responsible for maintaining a TQM philosophical base for their own organisation, as well as establishing the practices and protocols for quality planning. RAAF Logistics Command already has one such appointment. These positions would serve as that organisation's focal point for TQM direction and reporting, and arranging prizes, awards and publicity. The position should instigate appropriate incentive systems to encourage participation in the various committees.

People. Success of RAAF TQM largely rests with the people who ultimately have responsibility for quality--the middle and lower levels of staff that have the job expertise and experience. A RAAF TQM priority should be to involve all people in the improvement process and empower people to make decisions within their area of expertise, to not only do the work, but also to improve the system. Figure 9 summarises the "people" element of RAAF TQM.

The RAAF quality program responsibility starts with CAS and cascades through each level of RAAF management to each worker. Central to successful RAAF TQM implementation is the development of awareness about TQM. Senior management must firstly be exposed to the TQM principles and concepts

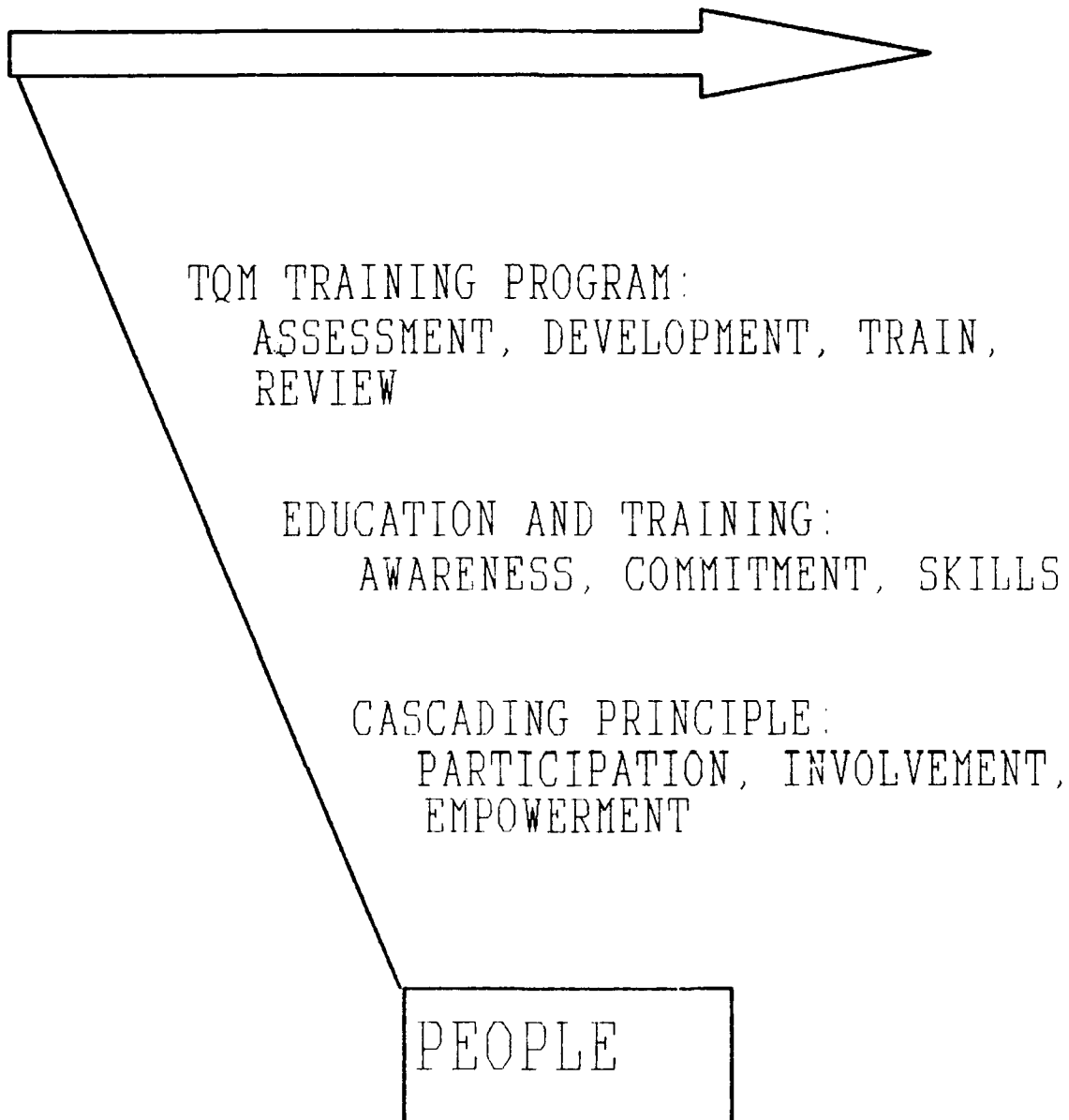


Figure 9. People and RAAF TQM



through such means as management development courses, seminars, videos, books and articles. The remaining RAAF workforce can then be trained through comprehensive TQM education and training courses, and on-the-job training. Every RAAF worker must be given opportunities, authority and responsibility for their quality improvement efforts. Moreover, people at each level of authority must be trained to use appropriate tools and techniques for quality improvement. RAAF TQM education and training should provide:

- 1) awareness of TQM principles and objectives,
- 2) motivation to make continuous improvements in the quality and productivity of all forms of work,
- 3) problem-solving and process improvement skills,
- 4) skills needed to work in teams,
- 5) knowledge about the changing RAAF culture and how to overcome inevitable barriers to TQM implementation.

Training should support the vision and goals set by CAS and commands. RAAF Training Command is the appropriate organisation to assist with initial development of a TQM education and training philosophy and model. Key personnel from this organisation must first be taught the philosophical basis of TQM and understand the various techniques and tools. The following steps provide broad guidelines for planning and coordinating a RAAF TQM training program.

- 1) Develop RAAF TQM education and training goals and objectives.

2) Develop organisational responsibilities for conduct of TQM education and training to ensure each RAAF organisation has consistent goals and is closely integrated.

3) Establish a RAAF TQM resource centre.

4) Identify funding sources and prepare budgets.

5) Plan and develop awareness courses for senior management.

6) Select and train educators and facilitators.

7) Conduct senior management awareness courses.

Solicit from those managers who have participated in the awareness courses information regarding the type of TQM training most needed, and special needs of RAAF organisations. Identify TQM tools and techniques to be used by the general RAAF community. Identify the skills needed by RAAF personnel to use TQM tools and techniques.

8) Plan and develop curriculums, and

9) Conduct and evaluate training courses.

Mass training of specific TQM tools and techniques should not be conducted unless the RAAF's culture and organisation's quality structures exist to allow immediate application of the knowledge gained from the course. Equally important, formation of improvement teams prematurely can also be counterproductive. Members expected to apply problem solving techniques in a PAT prior to being trained in those techniques, will quickly lose motivation and commitment to the activity.

Given the increasing fiscal constraints imposed on the RAAF, and the limited resources available for education and training, TQM training could be conducted within the existing training infrastructure. RAAF courses should be reviewed to assess the potential for incorporating TQM education. New training courses may be necessary to provide a more thorough understanding of TQM, and training in specific TQM tools and techniques. Also, specific courses should be offered for team building, process improvement training, and training new facilitators. As needs arise at a later date, courses could be developed in advanced TQM topics such as quality function deployment and design of experiments.

The overall objective of RAAF TQM education and training, therefore, is to make every person aware of TQM, committed to process improvement, and skilled in appropriate problem-solving techniques. The RAAF workforce will then become participants in continuous process improvement and empowered to exercise self-direction in the improvement process.

Continuous Process Improvement. The framework for implementation of TQM is not complete without a process improvement model to improve operational effectiveness, efficiency and adaptability of RAAF processes. A method should be adopted to facilitate and guide QMB and PAT initiated process improvements. An improvement method, or

cycle can systematically identify key problems and provide a strategy for improving processes.

A possible RAAF improvement methodology is as follows:

Step 1. Select a process to improve. Establish the extent of the process to improve. Set goals for improvement.

Step 2. Define the process and identify the customers and suppliers of the process. Flowchart and document the process before initiating change. Select the critical points in the process and identify the current measurement points.

Step 3. Identify all variables impacting the process and select specific process variables to change.

Step 4. Identify process improvement opportunities. Improve the process to meet defined customer requirements and/or improvement objectives.

Step 5. Assess improvement performance. Document the process to improve and update process definitions and flow diagrams to reflect the new methods.

Step 6. Monitor and track improvements to ensure the process remains in control. Return to Step 1 for continuous process improvement.

These steps serve as a method of achieving and maintaining continuous process review. An assortment of TQM tools and techniques should be used for the above process analysis. For example, histograms and Pareto diagrams help determine causes of poor quality. Techniques such as brainstorming, and cause-and-effect analysis charts are used to develop alternatives and arrive at process improvements.

### Generalisability of Findings

Although this research focused primarily on TQM developments in the U.S. DOD, the findings are considered generalisable to the RAAF. The research did not address specific concerns about the RAAF's ability to implement a quality program. Rather, general TQM implementation guidelines were presented which could be adapted by any organisation--military, government or private sector. Adoption of the principles presented in this chapter should result in a new strategic direction for the RAAF, and a significant change in management approach and work philosophy.

### Recommended Further Research

Potential exists for further research as the RAAF embarks upon implementation of a TQM agenda. The readiness of the RAAF to encounter a cultural change should be assessed. Such investigations should identify specific barriers to TQM incorporation, and recommend the organisational and managerial changes needed to create a suitable environment.

### Final Remarks

Government and non-government organisations alike, have for many years been guilty of placing priority on maximising faulty measures of productivity and output at the expense of quality. Like most organisations, the RAAF has unconsciously promoted inefficient practices and processes, and inhibited

change through overly bureaucratic structures and outdated policies. "New look" organisations in the 1990s have a quality and service consciousness, are responsive to innovation, and use highly trained people in group settings. TQM, if fully supported and adopted in a systematic way, can become the vehicle to pursue RAAF excellence, and achieve a culture of continuous improvement.

## **APPENDIX A: Total Quality Management Interview Guide**

### **Mission**

1. What is the primary mission of your organisation?
2. What characteristics must your organisation's "products" have to be judged successful?

### **Customers**

3. Who are your major organisational customers?
4. What are their expectations?

### **Implementation Strategy**

5. How was TQM introduced into your organisation?
6. How does TQM work in your organisation?
7. Did the introduction of TQM into your organisation cause major changes to your way of doing business?
8. What were the significant successes?

### **Barriers**

9. Prior to TQM introduction, what were the primary barriers, obstacles, constraints etc. which tended to oppose achievement of your organisational objectives?
10. Were these obstacles overcome with the implementation of TQM? If so, how? If not, why not?
11. Was there a good "environment" in your organisation to launch TQM? How was it created? What has been the reaction of the organisation's staff to TQM efforts?

### **Lessons Learned**

12. What would you do differently next time? Are there lessons for other organisations introducing TQM?

## **APPENDIX B: Continuous Improvement Process Elements**

Mansir, Brian E. and Nicholas R. Schacht.  
"An Introduction To The Continuous Improvement  
Process: Principles and Practices."

### **ORGANIZATIONAL TRANSFORMATION MODEL ELEMENTS**

#### **Envision and enable**

- Recognize the need to change
- Use outside consultants to start
- Develop internal facilitators
- Form a Steering Committee
- Educate members in philosophy
- Establish a vision for organization
- Develop a business strategy
- Prepare mission statement
- Prepare information package
- Make a long-term commitment
- Demonstrate top-management commitment
- Make time for improvement a policy
- Conduct an internal assessment
- Relate principles to organization
- Examine policies and practices
- Examine communications processes
- Open communications channels
- Remove obvious barriers to improvement
- Eliminate systemic sources of fear
- Create a conducive environment
- Examine and improve support systems
- Align reward and recognition
- Conduct an external assessment
- Establish a customer focus
- Understand customer needs and expectations
- Encourage individual effort
- Establish an effective suggestion system
- Stimulate creative thinking
- Empower individuals to make a difference
- Enable individual improvements (see individual model)

#### **Focus**

- Develop an improvement plan
- Establish goals and objectives
- Develop top-level measurement system
- Inform and involve everyone
- Disseminate information package to everyone
- Discuss CIP throughout organization
- Deploy goals and objectives into organization
- Involve customers and suppliers



## Learn

- Define learning needs
- Develop learning systems
- Determine learning methods
- Obtain learning materials
- Teach just in time
- Teach on the job
- Let supervisors teach subordinates
- Provide learning staff support
- Make learning a high priority
- Recognize and reward learning achievement

## Team build

- Cultivate leadership
- Select QMB members
- Establish purpose for QMBs
- Form QMBs
- Create cross-functional teams
- Create special teams
- Train teams
- Designate team leaders
- Remove team obstacles
- Form process-improvement teams
- Train improvement teams
- Use improvement projects
- Integrate natural work-group teams
- Recognize and reward CIP behavior
- Support continuous improvement

## Improve

- Employ a disciplined methodology (see process model)
- Initiate improvement cycle activity
- Develop process/team measurement systems
- Define and standardize processes
- Gain control of processes
- Simplify processes
- Improve processes
- Eliminate non-value-added activity
- Make processes foolproof
- Focus on upstream processes
- Apply simultaneous engineering concepts
- Apply robust design development concepts
- Focus on system inputs
- Apply just-in-time concepts
- Focus on organizational systems
- Apply cellular processing concepts
- Apply leadtime reduction concepts
- Focus on system outputs
- Apply inventory reduction concepts
- Focus on downstream processes
- Apply timely feedback concepts

## Evaluate

- Measure organizational performance
- Assess and analyze data
- Evaluate improvement results
- Assess progress
- Recycle improvement effort

## PROCESS-IMPROVEMENT MODEL ELEMENTS

### Set the stage for process improvement

- Create the environment
- Select the improvement team
- Train the improvement team
- Educate about improvement tools
- Discuss mission statement
- Discuss quality issues
- Set ground rules and logistics

### Select a process to improve

- Identify opportunities
- Localize the problem
- Create an improvement plan
- Establish operational definitions
- Establish team objectives
- Identify key measures

### Define the process

- Describe the process or problem
- Flow chart the process
- Identify supplier/customer relationship
- Identify measures of performance
- Relate measures to customer needs and expectations
- Assure capable measurement system

### Standardize the process (SDCA)

- Standardize
  - Standardize procedures
  - Assess process stability
  - Reduce variation in measure system
  - Assure controlled measure system
  - Analyze special causes of variation
  - Correct special causes
  - Bring process under control
  - Document the standard
  - Communicate the standard
  - Promote the standard

### Do

- Train to the standard
- Enable the standard
- Enforce the standard

Check

- Measure results to the standard
- Respond to deviation from the standard
- Identify root causes
- Analyze common causes of variation

Act

- Reduce variation in process
- Prevent recurrent deviation from standard
- Document standard improvements
- Revise the standard

Tighten the Process

- Assess process capability against requirements
- Streamline the process
- Error-proof the process
- Straighten-up the work area
- Eliminate unnecessary equipment
- Institute total productive maintenance
- Document lessons learned
- Collect and maintain process-performance data

Improve the process(PDCA)

Plan

- Develop questions
- Develop a theory
- Analyze available process data
- State a goal
- Plan a change or test
- Design system changes
- Define expected outcomes
- Identify process measures
- Plan data collection strategy
- Establish a test measurement process
- Test and refine data collection

Do

- Train to the plan
- Enable the plan
- Conduct cause-and-effect analyses
- Carry out the change or test
- Follow the plan
- Experiment with process changes

Check

- Observe/collect the data
- Analyze the data
- Look for pattern in data
- Compare data with theory
- Respond to deviations from plan
- Identify root causes
- Determine type of cause
- Correct special causes immediately
- Look for alternative solutions
- Determine impact on outcomes
- Determine whether objectives are met
- Determine whether theory needs revision
- Summarize what was learned

## Act

- Prevent recurrent deviation
- Redesign products or processes
- Implement permanent change in the process
- Continue to collect and analyze data
- Document and standardize the change
- Continuously monitor the process
- Develop a strategy for further improvement
- Repeat SDCA and PDCA cycles
- Assess improvement performance
  - Organize data
  - Document project results in picture book format
  - Make final presentations of PDCA story
  - Evaluate team methods
  - Evaluate project results
  - Recommend follow-up activity
  - Celebrate PDCA cycle completion
  - Recognize and reward CIP behavior
  - Select a new process to improve

## INDIVIDUAL-IMPROVEMENT MODEL ELEMENTS

- Envision personal improvement
  - Cultivate your self-awareness/image
  - Develop behavior/expectation matrices
    - Assess your relationship with supervisor
    - Assess your relationship with peers
    - Assess your relationship with subordinates
    - Assess relationships with union
    - Assess relationships with customers
  - Evaluate your need/desire to improve
  - Create a personal vision for improvement
- Enable personal improvement
  - Improve your education
  - Study concepts
  - Attend conferences
  - Pursue training just in time
  - See your job as learning experience
  - Learn to use the CIP tools
  - Learn to measure and understand processes
  - Learn to use data to support your decisions
  - Learn to differentiate data and information
  - Seek support for your improvement effort
- Focus on improvement
  - Examine your mission
  - Establish goals and objectives
  - Communicate your goals
  - Develop a personal-improvement strategy/plan
  - Create job outcome/CIP behavior matrix
  - Describe your behaviors vis-a-vis subordinate
  - Perform a personal signal analysis

Make improvement a high priority  
Make time in your schedule to improve  
Organize your activity to make improvement possible  
Recognize your responsibility to improve  
Take advantage of learning opportunities

Improve your job  
Define your job  
Recognize the processes you own  
Address your job processes  
Understand how your processes link to others  
Understand the capabilities and limitations of your processes  
Know your customers  
Understand their needs and expectations  
Establish routine dialogue with them  
Identify problem areas in your job  
Address critical areas first  
Use a systematic approach to improvement  
Remove complexity and simplify your job  
Pursue small incremental improvements

Improve your behavior  
Constantly challenge your behavior  
Demonstrate leadership  
Demonstrate commitment  
Take initiative  
Take long-term view  
Set an example  
Maintain self-control  
Align your activities with your goal  
Continuously pursue your goals  
Expect improvement in yourself  
Make personal improvement a routine  
Become a good team player  
Foster cooperation  
Foster communication  
Be observant  
Become a good listener  
Open up your communication channels  
Remove the barriers you erect  
Work to eliminate your fears  
Don't be unduly critical of yourself  
Pursue innovative thinking and new ideas  
Eliminate roadblocks  
Trust and deserve trust

Help other improve  
Make time in your schedule to help others improve  
Involve others in decision processes  
Train others  
Coach and nurture  
Create more leaders  
Facilitate teamwork  
Help remove others' barriers  
Learn what questions to ask and how to ask them

Encourage small improvements by others  
Support implementation of subordinate's ideas  
Welcome the news of problems as opportunities  
Expect improvement in others  
Help remove the sources of others' fears  
Welcome the new ideas of others  
Evaluate your improvement  
Recognize the value of correct effort versus results  
Judge others fairly and correctly  
Don't be unduly critical of others  
Document improvement in an improvement journal  
Celebrate your successes  
Celebrate the successes of others

## **APPENDIX C: U.S. DOD Posture on Quality**

Department of Defense Quality Letter - 30 Mar 88  
"DOD Posture On Quality"

- Quality is absolutely vital to our defense, and requires a commitment to continuous improvement by all U.S. DOD personnel.

- A quality and productivity oriented Defence industry with its underlying industrial base is the key to our ability to maintain superior level of readiness.

- Sustained U.S. DOD wide emphasis and concern with respect to high quality and productivity must be an integral part of our daily activities.

- Quality improvement is a key to productivity improvement and must be pursued with the necessary resources to produce tangible benefits.

- Technology, being one of our greatest assets, must be widely used to improve continuously the quality of Defense systems, equipments and services.

- Emphasis must change from relying on inspection, to designing and building quality into the process and product.

- Quality must be a key element of competition.

- Acquisition strategies must include requirements for continuous improvement of quality and reduced ownership costs.

- Managers and personnel at all levels must take responsibility for the quality of their efforts.

- Competent, dedicated employees make the greatest contributions to quality and productivity. They must be recognised and rewarded accordingly.

- Quality concepts must be ingrained throughout every organisation with the proper training at each level, starting with top management.

- Principles of quality improvement must involve all personnel and products, including the generation of products in paper and data forms.



## **APPENDIX D: Roadmap to Total Quality Management**

**A Three Phase Approach  
Developed by Major Kenneth R. Jennings,  
U.S. Air Force Institute of Technology  
Wright Patterson AFB OH**

### **I. The Assessment and Planning Phase**

#### **Milestone 0--Readiness Review**

**Purpose:** Initial assessment of the readiness of the client organization to undertake a comprehensive Total Quality Management process.

**Outcome:** Clarification of the scope of the TQM process in client organization. Identification of key areas for change. Negotiation of AFIT-client responsibilities and expectations.

**Delivery Mode:** AFIT Team on-site with diagnostic instruments and checklists. Debriefing and planning with senior management.

#### **Milestone 1--Executive Education**

**Purpose:** Introduction of the philosophy and tools of the TQM process to the senior management directing a TQM effort. Initiation of improvement efforts selected senior management processes.

**Delivery Mode:** AFIT on site assistance with Executive overview presentation by AFIT Team.

#### **Milestone 2--Strategic Planning**

**Purpose:** Development of comprehensive plan to integrate TQM into every aspect of the client organization.

Outcome: Interlocking strategic and sub-unit operational plans to implement and promote TQM. Formation of TQM steering committees, process action teams (PATS), and corrective action teams (CATS).

Delivery Mode: Consulting Module-AFIT Team, Senior management, and selected support personnel at a suitable meeting location.

## II. The Process Management and Breakthrough Phase

### Milestone 3--Process Ownership and Definition

Purpose and Outcome: Selection and training of individual "owners" for critical organisational processes, along with the associated process action teams. These owners, in concert with process action teams, have the responsibility and authority to improve cross-functional processes. In defining processes, the process owner and the PAT identify the following: internal suppliers and customers, measureable indicators of quality and service to internal customers, and critical process variance points. This definition forms the framework for the further phases of process management.

Delivery Mode: AFIT Process Management Training.

### Milestone 4--Process Simplification, Measurement and Control:

Purpose and Outcomes: Training of the PATS in techniques to simplify, measure and control their respective process in an ongoing manner. Outcomes include process streamlining,

measurement systems development, and formal control procedures.

Delivery Mode: AFIT Process Management Training.

Milestone 5--Process Improvement

Purpose and Outcome: Training of the PATs and relevant support groups in techniques to improve the processes in an ongoing manner.

Delivery Mode: AFIT Process Management Training.

Milestone 6--Breakthrough Projects

Purpose and Outcomes: Corrective Action Teams (CATs) trained in advanced and specialised problem solving techniques. The CATs are directed by the steering committee toward solving selected high payoff quality, service and performance problems.

Delivery Mode: Under development at this time.

### III. The Institutionalisation Phase

Milestone 7--Information and Measurement System Design

Purpose and Outcomes: Development or modification of information and measurement systems to reinforce and support ongoing TQM. Systems are designed to deliver needed information directly to those closest to the points of process control. Systems are relatively complete cross-functional processes. Target systems include: Management Information Systems, Decision Support Systems, Inventory Control Systems, Expert Management Systems, and Variance Measurement and Reporting Systems.

Delivery Mode: To be developed.

Milestone 8--Job and Task Design

Purpose and Outcome: Realignment and restructuring of the organisation's basic job and task design to form relatively permanent teams to manage complete processes. This will require a graduated change from strictly functional organisational structures to process related structures. The result will be reduced barriers to management and increased work process capability.

Delivery Mode: AFIT Consulting Team on-site.

Milestone 9--TQM Evaluation

Purpose and Outcome: Comprehensive evaluation of the attitudes, actions, systems and supports critical to the ongoing success of TQM. Results of the evaluation are fed back to the client organisation for action planning.

Delivery Mode: AFIT Consulting Team using various organisational evaluation techniques.

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### Vita

Flight Lieutenant Clayton Lloyd Noble was born on 26 January 1961 in Parkes, New South Wales, Australia. He matriculated from Parkes High School, New South Wales, in 1978 and joined the Royal Australian Air Force as a Business Studies Cadet in January 1979. After receiving the degree of Bachelor of Business from Darling Downs Institute of Advanced Education in December 1981 he was awarded a Queen's Commission as an officer in the Supply Branch. His initial posting was to Headquarters Support Command where he served as Stock Control Officer, Procurement Officer, and Warehousing Officer. In March 1984 he was posted to the Australian Defence Force Academy as that unit's first Stores Officer. In April 1987 he was posted to the Supply Systems Redevelopment Project as a cost benefit analyst and project manager, until entering the School of Systems and Logistics, United States Air Force Institute of Technology, in June 1989. Following graduation from AFIT he will proceed to the Directorate of Logistics Information Services, Headquarters Logistics Command, Melbourne, Australia, to investigate new computer technology for the RAAF.

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